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William Blair-Bell Memorial Lecture*

Uterine Inertia

BY

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INTRODUCTION.

I AM deeply conscious of the honour conferred on me by the Council of the College of Obstetricians and Gynaecologists in inviting me to present the first William Blair-Bell Memorial Lecture. At the same time, I fully realize the difficulty of the task which lies before me—the task of delivering a lecture which shall do justice to the memory of Blair-Bell and merit the distinction of being the first of a series dedicated to his name.

When Blair-Bell died in 1936, gynaecology and obstetrics lost one of its foremost leaders and one who, in his time, had done perhaps more than any other one man to further knowledge and practice of this specialty. He will always be remembered for his original investigations into gynaecological physiology and pathology. He was among the first to emphasize the importance of endocrinology and subsequent events have proved how right he was in considering the pituitary gland as being of primary importance in sexual physiology.

Apart from his scientific work, Blair-Bell is assured of remem-

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brance by reason of the College of Obstetricians and Gynaecologists. He was one of the pioneers responsible for its founding and, as its first President, overcame difficulties of such magnitude that few will deny that the present high status enjoyed by the College is for the most part due to his efforts.

Furthermore, by those of us who knew him well, he will be remembered as a man—a man possessed of an active and original brain, boundless knowledge, relentless determination and a zeal for work—a continual inspiration to his immediate associates. The effect of his forceful personality and unquestioned ability has left an indelible mark on gynaecological practice not only in this country but throughout the world.

I count myself fortunate in having been one of Blair-Bell's students and assistants, and I owe him much. To have been under his influence and to have worked with him is a privilege for which I shall always be grateful. It is, therefore, with mixed feelings that I present this lecture. I welcome the opportunity to pay honour to the name of Blair-Bell and yet, knowing well the high standard which he always set, I fear lest I should fail in my duty toward him.

Uterine inertia forms an appropriate subject, for it is one in which Blair-Bell was always particularly interested. Indeed, he was the first to use posterior pituitary extract in the treatment of all states of uterine atony.[1]

His views on uterine inertia were at variance with those of most obstetricians of his day, but were views which are now becoming more and more accepted, although in modified form. He recognized a physiological and protective type of inertia which occurs at the commencement of labour, particularly when dilatation of the cervix is slow as in occipito-posterior positions of the foetus. This he regarded as being reflex in origin—arising as a result of lack of stimulation of the lower segment by the presenting part or directly due to the tardy dilatation of the cervix. Apart from this condition he considered that uterine inertia, whether it be primary or secondary is, for the most part, caused by a deficiency of pressor substances in the blood-stream—pressor substances being such principles as posterior pituitary extract, calcium salts and other minerals necessary for the efficiency of unstriped muscle. Following the discovery of the relative effects of oestrogenic and corpus luteum hormones on uterine muscle, he modified his views to include oestrogenic substances among the pressor factors.

His conception of the importance of posterior pituitary hormone as a factor controlling uterine action has for some time been viewed with scepticism by most observers. Recently, however, fresh evidence has been brought forward (Fisher, Magoun and Ranson[2]) and it would seem that Blair-Bell's views may still prove to be correct.

Some Factors Controlling Uterine Action

The study and treatment of uterine inertia demands a knowledge of the normal behaviour of the uterus in labour and the factors which ordinarily control it. I wish, therefore, to consider briefly the following relevant physiological processes.

1. The preparation of the uterus during pregnancy.
2. The cause of the onset of labour.
3. The mechanism of cervical dilatation.

Preparation of the Uterus during Pregnancy.

Parturition is not a single isolated event, but is more properly considered as the climax of a process which begins with ovulation and ends with involution.

The physical development of the uterus during pregnancy is of first importance to its behaviour during labour. This development is to some extent directly due to the gradually increasing bulk of the products of conception (*vide* Reynolds,[3, 4, 5]) and no doubt is also dependent on an adequate supply of ordinary nutritive agents—both organic and inorganic. But it is for the most part due to the effects of corpus luteum and oestrogenic hormones. These hormones not only promote increased vascularity and hypertrophy of the muscle but also control its contractions, sensitivity and tone. In this connexion progesterone is inhibiting while the oestrogens are activating, and in their respective actions it is possible that they are influenced by other hormones derived from the placenta, pituitary and adrenal glands and by Vitamin E. (Shute[6]). As pregnancy advances the amount of oestrogenic hormone in circulation* increases, but until the later weeks the major part is in a combined and inactive form. During the period immediately preceding the onset of labour, however, it becomes activated and free to exert its full biological effect. As the oestrogenic hormone becomes more and more dominant so does uterine sensitivity increase.

* The oestrogenic hormone during pregnancy in the human being has its origin in the placenta. The foetus, therefore, by reason of its chorion, controls the determination of its own intra-uterine existence.

The Cause of the Onset of Labour.

When the uterus becomes fully sensitized by the action of oestrogenic hormone, any minor stimulus may be sufficient to establish the onset of labour. Stimulation of the lower uterine segment by the presenting part sometimes is responsible, but it is not essential. An emotional change is sufficient at other times.

It may be that oestrogenic hormone not only increases uterine sensitivity but also provokes the onset of expulsive uterine contractions. This possibility arises as the result of experiments carried out on rabbits by Reynolds.[4, 3, 7] He showed that a foreign body distending the uterine cavity causes muscle hypertrophy and enlargement of the uterus. This growth response is, however, limited by oestrogenic hormone. It is postulated, therefore, that labour commences when the action of oestrogens is so great that it prevents further uterine enlargement, and expulsion of the products of conception is the necessary outcome.

Finally, the view that the oxytocic principle of the posterior lobe of the pituitary is operative in causing the onset of labour has still to be disproved. The recent work of Fisher, Magoun and Ranson,[2] mentioned previously, is strongly in its favour.

It is logical to assume that the factors bringing about the onset of expulsive contractions are of first importance in the maintenance of such contractions during labour. In this they may, however, have the assistance of stimuli arriving through the parasympathetic nerve system.

The Mechanism of Cervical Dilatation.

The behaviour of the upper segment of the uterus is closely related to that of the lower segment of the cervix. Expulsive contractions of the uterus result in dilatation of the cervix and *vice versa*.

It was formerly believed that dilatation of the cervix is brought about by the pressure of the hydrostatic bag of membranes. Premature rupture of the membranes was supposed to be a common cause of delay in cervical dilatation and hence of uterine inertia. During recent years the widespread use of artificial rupture of the membranes as a means of inducing labour has proved this view to be fallacious. All writers[8–18] are agreed that rupture of the membranes hastens rather than delays dilatation of the cervix.

The cervix is no longer to be regarded as a purely passive component of the uterus. Its dilatation is the result of active con-

traction and retraction of its longitudinal fibres.[11–13, 19–22] An alteration in the anatomical arrangement of the circular fibres may also be concerned (Kreis[23]).

The process whereby the cervix is retracted over the presenting part is undoubtedly favoured by a presenting part which fits the lower uterine segment accurately. Any condition interfering with the close and even application of the head to the lower segment, not only retards dilatation of the cervix but also leads to a decrease in the efficiency of uterine contractions. This effect is probably the result of inadequate stimulation of nerve elements in the lower segment and adjacent tissues. Whatever be the mechanism, however, pressure of the presenting part on the lower uterine segment certainly plays an important *rôle* in determining the frequency and severity of the pains.

Anomalies in cervical dilatation are, therefore, usually associated with disordered uterine contractions and in any case of delayed labour it is frequently impossible to say whether the feeble contractions are the result, or the cause of, slow dilatation of the cervix, or whether both processes are at fault.

To summarize, the nature of uterine contractions and the progress of cervical dilatation are largely dependent on the relation between the passenger and passages. In the absence of mechanical faults in this relation, however, endocrinous factors are of considerable importance in determining the behaviour of the uterus. They are not only of first concern in the preparation of the uterus during pregnancy but are also responsible for the onset and maintenance of expulsive uterine contractions. Inertia which is not the result of a mechanical obstacle to delivery may, therefore, be caused by a relative insufficiency of activating principles such as oestrogenic hormone and possibly oxytocin from the posterior lobe of the pituitary gland. Of these the oestrogenic hormone is the more important. Evidence for this is well known and does not require any repetition. I would remind you, however that, so far as animals are concerned, oestrogenic hormone is the only substance known which will stimulate an inactive uterus. Oxytocin is ineffective except in the presence of one of the oestrogens.

The effects of oestrogenic principles on uterine muscle may be summarized as follows:

1. Increased vascularity.
2. Increased metabolism and oxygen consumption (Reynolds and MacLeod[24]).

3. Hypertrophy of muscle. Also limitation of the growth of muscle which ordinarily results from the presence of a foreign body in the uterus.
4. Increase in tone and spontaneous contraction.
5. Increased sensitivity to oxytocic agents.
6. Co-ordination of uterine contractions.
7. Indirect stimulation by effecting the secretion of oxytocin from the posterior lobe of the pituitary. (Doubtful.)

In view of the above considerations, and bearing in mind its mode of action, it was decided to carry out a clinical investigation into the effect of oestrogenic hormone on patients suffering from uterine inertia in labour. The details of the results are recorded here for the first time.

Technique of Treatment.

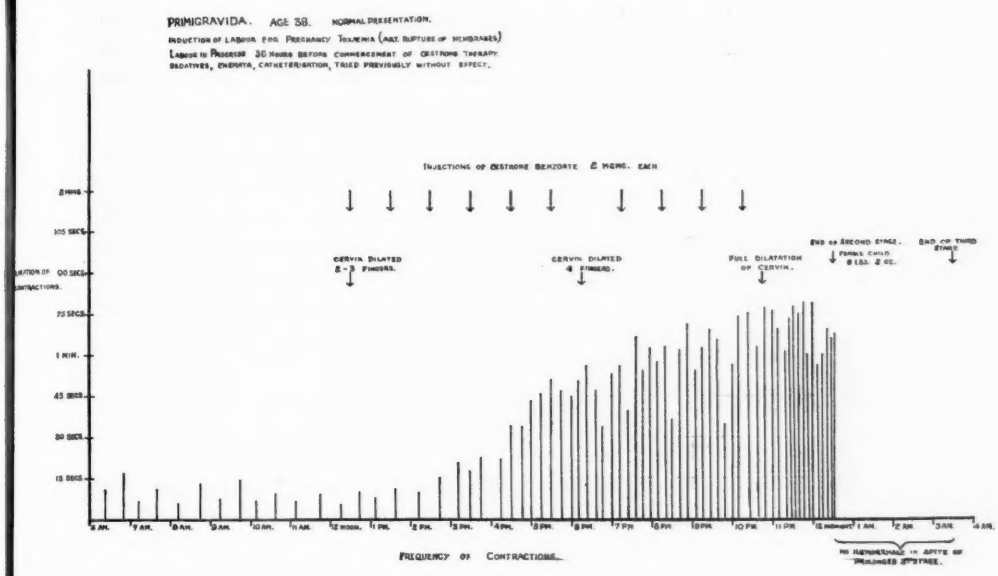
Emotional disturbances are often concerned in the etiology of inertia and any method of treatment may improve uterine action by means of a psychological effect. It is, therefore, always difficult to assess the results. Further difficulty arises because it is occasionally impossible to determine the exact time of onset of labour and the presence of weak but painful contractions a few days before labour may be mistaken for inefficient contractions of the first stage. It is, however, impossible to control any form of treatment of uterine inertia.

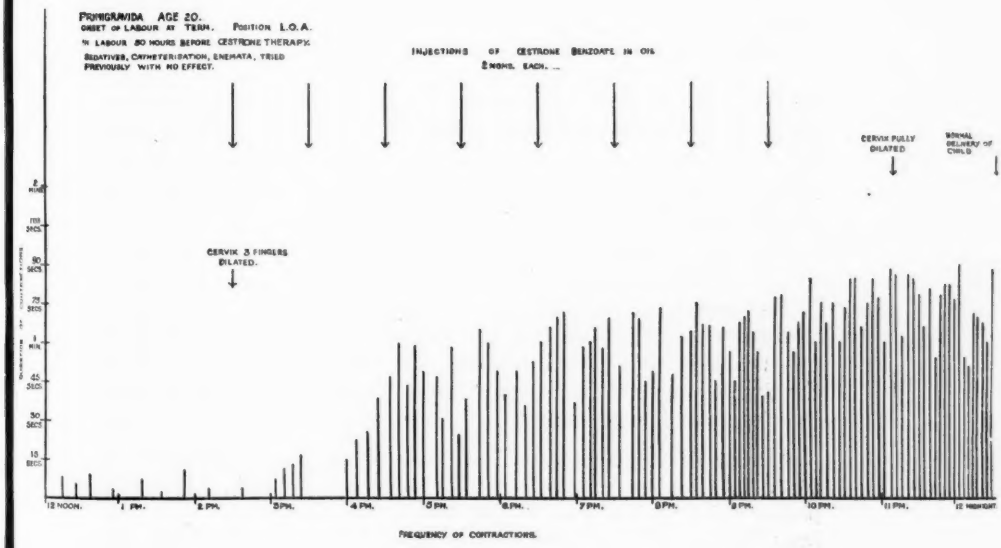
In this trial of oestrogenic hormone therapy the following precautions were therefore taken:

1. Only cases of inertia of long standing and characterized by complete or almost complete cessation of the pains were accepted, thus only 88 cases suitable for treatment were encountered in a series of over 12,000 confinements. Some authorities regard disordered contractions, as distinct from feeble or infrequent contractions, as a type of inertia. Cases of uterine inefficiency of such a type were excluded from this investigation, since it is so difficult to estimate the value of their treatment.

2. Ordinary methods of treatment for inertia such as the administration of sedatives and enemata, together with catheterization, were always tried first and only when these were unsuccessful was oestrogenic hormone given.

3. The results were assessed by an independent experienced observer.


PRIMIGRAVIDA. AGE 38. NORMAL PRESENTATION.
INDUCTION OF LABOUR FOR PREGNANCY TOXAEMIA (AFT. RUPTURE OF MEMBRANES)
LABOUR IN PROGRESS 36 HOURS BEFORE COMMENCEMENT OF OESTRONE THERAPY.
SEDATIVES, ENEMATA, CATHETERISATION, TRIED PREVIOUSLY WITHOUT EFFECT.
INJECTIONS OF OESTRONE BENZOATE 2 MGMS. EACH
CERVIX DILATED 2-3 FINGERS.
CERVIX DILATED 4 FINGERS.
FULL DILATATION OF CERVIX.
END OF SECOND STAGE. FEMALE CHILD 6 LBS. 2 OZ.
END OF THIRD STAGE
2 MINS
105 SECS
90 SECS
75 SECS
1 MIN.
45 SECS
30 SECS
15 SECS
2 AM. 7 AM. 8 AM. 9 AM. 10 AM. 11 AM. 12 NOON. 1 PM. 2 PM. 3 PM. 4 PM. 5 PM. 6 PM. 7 PM. 8 PM. 9 PM. 10 PM. 11 PM. 12 MIDNIGHT 1 AM. 2 AM. 3 AM. 4 AM.
NO HAEMORRHAGE IN APITE OF PROLONGED 3RD STAGE.
FREQUENCY OF CONTRACTIONS.


PRIMIGRAVIDA AGE 20.
ONSET OF LABOUR AT TERM. POSITION L.O.A.
IN LABOUR 30 HOURS BEFORE OESTRONE THERAPY.
SEDATIVES, CATHETERISATION, ENEMATA, TRIED PREVIOUSLY WITH NO EFFECT.
INJECTIONS OF OESTRONE BENZOATE IN OIL 2 MGMS. EACH.
CERVIX FULLY DILATED
NORMAL DELIVERY OF CHILD
CERVIX 3 FINGERS DILATED.
2 MINS
105 SECS
90 SECS
75 SECS
1 MIN.
45 SECS
30 SECS
15 SECS
12 NOON. 1 PM. 2 PM. 3 PM. 4 PM. 5 PM. 6 PM. 7 PM. 8 PM. 9 PM. 10 PM. 11 PM. 12 MIDNIGHT
FREQUENCY OF CONTRACTIONS.

4. The duration of uterine contractions, and the intervals between them, were charted before, during and after treatment (see Figs. 1 and 2). The effect on cervical dilatation and the progress of labour were also taken into consideration in the interpretation of results.

Various oestrogenic substances* were employed—oestradiol benzoate in oil, oestrone benzoate in oil, oestrone in oil and oestrone in aqueous solution. In all cases the hormone was administered intramuscularly and, with a few exceptions, at one hourly intervals. The injections were continued for 8 to 10 hours —unless delivery was completed before the end of that time. The amount of hormone injected on each occasion varied with the preparation used:

Oestradiol benzoate in oil	2 mgms.
Oestrone benzoate in oil	2 mgms.
Oestrone in oil	1 mgm.
Oestrone in aqueous solution	0.04 or 0.05 mgm.

Results.

Eighty-eight patients were treated, of whom only 16 had been less than 24 hours in labour when treatment was commenced: the average duration of labour before the first injection was 45.8 hours.

When the uterine response, as judged by the character of the contractions and the progress of labour, was very good, good or fairly good, the treatment was regarded as being successful. If, however, there was only slight and temporary improvement in uterine efficiency, or if the hormone failed to have any beneficial effect, the treatment was classified as unsuccessful. It should be pointed out that a patient regarded as having been treated successfully was not always delivered by natural forces alone. Various complications in addition to the inertia were at times present and instrumental delivery or even Caesarean section was sometimes carried out. The success of treatment in such cases was gauged by its effect on the progress of labour up to the time when some indication such as foetal distress made operative intervention necessary.

* Commercial preparations used were Oestroform, Oestroform B (B.D.H.), Progynon B (Scherings), Dimenformone (Organon), Ketodestrin (Paines and Byrne), and special ampoules of oestrone presented by British Drug Houses. All these were kindly supplied free or at reduced price by the respective firms.

TABLE I.

Results of treatment of inertia with oestrogenic hormones.

Type of inertia	Successful: Very good	Successful: Good	Successful: Fairly good	Unsuccessful: Slight or temporary improvement	Unsuccessful: No response	Unsuccessful: Doubtful result	Total	Percentage of cases successfully treated
Primary:								
Complicated by mechanical fault ...	1	3	6	8	12*a*	—	30	33.3
Uncomplicated	20	5	4	2*a*	2*ab*	4*c*	37	78.4
Secondary:								
Complicated by mechanical fault ...	—	—	2	—	5*a*	—	7	28.5
Uncomplicated	7	1	1	—	5*a*	—	14	64.3
Total ...	28	9	13	10	24	4	88	56.8

a=Poor technique in one case of each group.
b=One patient possibly not in labour at time of treatment.
c=All very good results, but effect may have been due to accessory procedures.

TABLE II.

Mode of delivery.

	Natural forces	Instrumental delivery	Caesarean section	Total
Cases successfully treated ...	27	19	4	50
Cases in which treatment was unsuccessful	11	18	5	34
Cases in which the result was doubtful	3	1	—	4
Total	41	38	9	88

According to this method of assessment the treatment was successful in 50 out of 88 cases (56.8 per cent). In these, labour was completed spontaneously in 27 (54.0 per cent). Excluding those patients ultimately delivered by Caesarean section, the average duration of labour after the commencement of treatment was 9.5 hours. In 34 patients (38.6 per cent) the treatment failed. In these the average duration of labour after the first injection of oestrogenic hormone was 27.2 hours and only 11 patients (32.3 per cent) were delivered spontaneously (see Table II).

These results, however, require further analysis—particularly from the point of view of the aetiology of inertia.

Primary and Secondary Inertia.

It is customary to describe inertia as being primary or secondary, each having a different aetiology. Blair-Bell always taught that the causes of both are essentially the same and that this classification is artificial. Study of this series of cases provides support for the view that there is no theoretical or practical reason for regarding primary and secondary inertia as separate clinical entities. Indeed, it is often impossible in practice to say whether inertia is primary or secondary. Further difficulty arises because some authors now use these names to mean complicated or uncomplicated inertia. As alternate terms "inertia in the first stage" and "inertia in the second stage" of labour are preferable. Such a division does not infer a difference in aetiology and is of great value from the point of view of treatment—which does vary with the stage of labour. If the cases are considered in the light of the old classification there were 67 of primary, and 21 of secondary inertia. The results of treatment with oestrogenic hormone were similar in both groups, viz.

	Number of cases	Successful results	Percentage successfully treated
Primary	67	39	58.2
Secondary	21	11	52.4

If the cases are divided according to the stage of labour when treatment was commenced, the results again do not show any appreciable difference.

	Number of cases	Successful results	Percentage successfully treated
Inertia in first stage ...	74	42	56.7
Inertia in second stage ...	14	8	57.1

The response to oestrogenic hormone, therefore, does not bear any relation to the time of onset of the inertia, nor to the stage in labour at which treatment is commenced. This finding provides further support for the belief that inertia is a single clinical entity, although it may make its appearance at different stages of parturition.

Presence of Mechanical Faults in Association with Inertia.

As pointed out previously the efficient behaviour of the uterus is, to a large extent, dependent on the accuracy with which the presenting part fits the lower uterine segment. Thus, if the foetus lies in an occipito-posterior position, weak or irregular uterine contractions frequently result. If the foetal head subsequently flexes, fits the lower segment well and rotates, this inertia passes off. If, on the other hand, the malposition of the foetus persists, the inertia usually continues. The same disturbance in uterine action may occur when there is disproportion at the brim, as in pelvic contraction or hydrocephalus.

In the second stage of labour, mechanical difficulty associated with delivery may likewise reflexly affect uterine contraction. The cause may be bony contraction or rigidity of soft tissues, but more frequently inertia is the result of faulty or incomplete rotation of the head, the best example being the condition known as deep transverse arrest. Accurate distension and adequate stimulation of the vagina and perineum are as important to the action of the uterus as they are to that of the abdominal muscles.

Observation of the patients in this series quickly showed that the response to treatment varied according to the presence or absence of such types of mechanical difficulty. The cases are, therefore, sub-divided into two groups (*a*) those complicated by some form of disproportion or malrotation of the head and (*b*) those cases in which such a complication was not present. In the uncomplicated class are included some examples of twin pregnancy, hydramnios or even frank breech presentation so long as

there was not any definite evidencè of a badly fitting presenting part (see Table VII).

Sub-division of the cases in this way reveals a startling difference in response to oestrogenic hormone treatment. The complicated cases reacted badly, only 12 out of 37 (32.4 per cent) deriving any benefit. In these, the response for the most part was only fairly good and one case alone is recorded as having shown a very good result. Sometimes the treatment produced some improvement in strength and frequency of uterine contractions, but the cervix rarely dilated satisfactorily, nor did labour progress to any extent until the underlying mechanical fault was corrected.

In the absence of mechanical obstacle to delivery, success was obtained in 38 out of 51 cases (74.5 per cent). In 4 further cases the result was excellent, but may have been due to accessory treatment and is, therefore, classified as doubtful. Of the 9 unsuccessful cases one patient was probably not in labour at the time of treatment, and in another 3, poor technique may have accounted for the adverse result. There were thus only 5 complete failures.

Considering that the patients receiving this treatment were all suffering from inertia of a severe degree and had not responded to any other form of treatment, it is submitted that these results are excellent.

Post-partum Haemorrhage.

Uterine inertia, when present, tends to persist into the third stage of labour, causing difficulty in placental separation and giving rise to post-partum haemorrhage. In this group of 88 patients, post-partum haemorrhage of moderate severity occurred on one occasion only. Four other patients experienced slight haemorrhage which was easily controlled. Manual removal of the placenta was twice necessary. Such a low incidence of difficulty in the third stage of labour is unusual for the severe types of inertia comprising this series.

Foetal and Maternal Mortality.

Treatment of uterine inertia by such means as posterior pituitary hormone is not always safe, and accidents to both mother and child may result. It is, therefore, of some importance to know whether oestrogenic hormone therapy has any adverse effect on the participants of childbirth.

In this series one mother died. She, however, only received two injections of hormone and was then subjected to Caesarean hysterectomy for intra-uterine infection. She died from peritonitis and ileus. There was no evidence in this or any other patient of any ill effect which could be ascribed to the oestrogenic hormone. No general or local reaction to injection was ever observed. The oestrogens never produce violent or spasmodic uterine contractions as does posterior pituitary extract. Their effect is to co-ordinate uterine action in addition to promoting more powerful and regular contractions.

Fourteen children were stillborn and 5 died in the neonatal period. The causes of death are shown in Table III. In only one case was foetal death, occurring after the commencement of oestrogenic hormone treatment, unexplained, but there was certainly no clinical evidence to suggest that the treatment had any adverse effect.

TABLE III.
Stillbirths and neonatal deaths.

Cause of death	Patients successfully treated	Patients unsuccessfully treated
Birth injury	3	4
Maldevelopment	2	2
Maternal toxaemia	1	—
Prematurity	2	—
Neonatal pneumonia	1	—
Intrapartum asphyxia before treatment	1	2
Unknown	—	1
Total	10	9

It seems permissible to state, therefore, that the treatment is free from risk to either mother or child.

Time Response.

It is not easy to correlate these results with experiments carried out on laboratory animals. Such experiments go to show that oestrogenic hormone only has a stimulating effect on uterine muscle some hours after its injection. Thus, in rabbits, the maximum response is not seen until 24 hours after administration of the hormone—although rhythmic muscle movements occur as early as 10 hours (Reynolds and Macleod[24]). More-

over, the use of oil solvents and hormone esters considerably delays absorption and utilization of the hormone by the body.

In the light of these facts it is difficult to understand the good and often brilliant results which quickly follow the administration of oestradiol benzoate in oil to a woman suffering from inertia. In most cases 2 or 3 hours' treatment was necessary before improvement in contractions was manifest, but in a few uterine function improved within 10 to 15 minutes of the first injection. Moreover, it was sometimes noticed that in the intervals between injections the contractions gradually decreased in force only to show renewed intensity after a further dose of hormone.

In the present state of knowledge it is impossible to account for these phenomena. Control experiments proved that the oil solvent, devoid of hormone, had no action on the inert uterus. It may be suggested that the effect was purely psychological and not hormonic. This argument, however, does not appear valid since most of these patients had received, earlier in labour, hypodermic injections and other forms of treatment calculated to be of psychotherapeutic value without the efficiency of the uterus being improved. Another possibility is the existence of a species difference and the human uterus may respond to hormone agents more quickly than does the rodent uterus. Also, it may well be that the parturient uterus, already prepared by oestrogenic hormone, reacts relatively rapidly to additional supplies of that hormone. Finally, it should be borne in mind that even in animals the uterine response, although not at a maximum until after 24 hours, must commence immediately after injection of the oestrogens. That this is true is proved by the fact that a vascular change reaches its maximum in the rabbit uterus within 30 minutes of administration of hormone.[24] Moreover, in mice, abortion takes place if posterior pituitary extract is given 12 hours after commencing injections of oestrone.[2]

Nevertheless, in the series of cases under review, an oily solvent was frequently employed and absorption could not have been complete during the period of parturition. Any effect on uterine action must, therefore, have been brought about by only a small proportion of the total hormone injected. In view of these considerations the later cases in this series were treated with preparations which are more quickly absorbed and utilized by the body. Oestrone was substituted for benzoate preparations of oestrone and oestradiol, and a few tests were made

using an aqueous rather than oily medium. The use of aqueous solutions necessitates giving a much smaller dose of hormone (.04 to .05 milligrams), but this disadvantage should be compensated for by its more rapid and complete absorption. The results show very little difference according to the different types of hormone used. Oestrone in 1 milligram doses produced as good results as did benzoate preparations in 2 milligram doses. The number of cases treated with aqueous solutions is as yet very small, but the impression gained by observers is that although only minute doses were used, they were as effective as the larger amounts of hormone esters dissolved in oil.

Oestradiol benzoate dissolved in oil (44 cases): 59.1 per cent successful results.

Oestrone benzoate dissolved in oil (28 cases): 57.1 per cent successful results.

Oestrone in oil (13 cases): 61.5 per cent successful results.

Oestrone in aqueous solution (3 cases): 33 per cent successful results.

Prophylactic Treatment of Inertia.

In view of the existence of a latent period between the injection of oestrogenic hormone and the development of its maximum effect on uterine musculature, it is logical to assume that such hormone should prove of greater value in the prophylactic, than in the curative, treatment of inertia.

The administration of oestrogenic principles during the last 2 or 3 weeks of pregnancy should serve to sensitize and improve the tone of the muscle and promote efficient contractions during labour. For this purpose a prolonged hormone effect is required, and the delayed but continuous action of benzoate preparations in oil is advantageous.

Unfortunately, it is impossible to foretell the occurrence of inertia with any degree of accuracy and the indications for treatment cannot be clearly defined. Nevertheless, oestrogenic hormone therapy was tried out on 51 patients in all of whom some abnormality was present or there was a definite reason for supposing that labour was likely to be prolonged and difficult (see Table IVa).

Oestradiol or oestrone benzoate was injected intramuscularly in a dose of 2 milligrams at intervals varying from 1 to 12 hours for periods of 1 to 21 days before delivery. The technique varied considerably, but the best results followed the

administration of hormone at 8 or 12 hourly intervals for 4 days or longer. The results are shown in Table IVB.

TABLE IVA.

Details of patients treated prophylactically with oestrogenic hormone.

	Multiparae	Primiparae
High head due to extension of head, faulty pelvic inclination	6	3
Occipito-posterior position. High head ...	1	3
Occipito-posterior position. Contracted pelvis	—	2
Minor degree of pelvic contraction ...	1	2
Atonic uterus and foetal malposition ...	4	1
Atonic uterus and foetal malposition and contracted pelvis	1	—
Atonic uterus. Elderly patients	2	—
Atonic uterus. Bad obstetric history ...	5	—
Atonic uterus	1	—
General ill-health	1	2
Twin pregnancy with hydramnios ...	—	2
Membranes ruptured for more than 3 days without onset of labour	4	4
No gross abnormality	4	2
Totals	30	21

TABLE IVB.

Results of prophylactic treatment of inertia.

	Primiparae	Multiparae
Number of patients	21	30
Duration of labour unknown	3	3
Caesarean section	1	1
Average duration of labour in remaining cases	15.6 hours	9.7 hours
Number who developed inertia in labour ...	1	2
Instrumental deliveries	2	2

The average duration of labour was within normal limits in spite of the presence of malpositions of the foetus, minor degrees of pelvic contraction, uterine atony, hydramnios and allied complications in most of the patients. The incidence of instrumental deliveries was low—considering the class of patient with

which we were dealing—and there were only three cases of inertia. In these three, very small amounts of oestrogenic hormone were given and injections were continued for less than 24 hours in two, and less than 48 hours in the third.

The labours for the most part were characterized by rapid and easy evacuation of the uterus. In some, no doubt, this would have occurred even without the treatment, but in most the ease with which delivery was accomplished was quite unexpected and was suggestive as to the efficacy of treatment.

Aetiology of Inertia.

I will next refer briefly to some of the causes of uterine inertia. Possible aetiological factors in the 88 patients observed are analysed in Tables V and VII. When more than one factor was present, only the one judged the most important appears in the Table. It should be borne in mind, however, that this series was specially selected in order to assay a particular form of treatment. This necessitated omitting cases of inertia due to emotional factors, or to minor disturbances which responded to other therapeutic measures. The data, therefore, do not give any accurate information as to the relative frequency of the various causes of inertia.

1. *Age and Parity.*

It is sometimes stated that debilitating disease, undernourishment and conditions likely to affect muscle vitality are common causes of inertia. Clinical experience does not substantiate this view, and the middle-aged woman, burdened by a large family, overwork and lack of financial means, usually has a rapid and easy labour provided that it is not complicated by malposition of the foetus. There were only two patients of this class in the uncomplicated group of this series.

All statistics go to show that it is the primipara who is prone to inertia—particularly those primiparae over 30 years of age. The predominance of primiparae in series of patients exhibiting faulty uterine contractions inevitably leads to the belief that the occurrence of inertia in the first labour is rarely followed by a similar complication in subsequent labours. It is interesting to speculate why this is so, and it would appear that the initial dilatation of the cervix is as effective in curing uterine incoordination in subsequent labours as it is in abolishing the colicky uterine contractions which give rise to dysmenorrhoea.

Moreover, women of a certain type are more susceptible than others. They are usually of heavy build (*vide* Matthews and der Brucke[26]) and often frankly adipose or possessing masculine characteristics. It is the athletic woman with well-developed musculature rather than the essentially feminine person with indifferent muscles, who is likely to have disordered uterine action. The reason for this is not clear, but it is partly explained by the fact that such physical characteristics are frequently found in association with abnormalities in the contour of the bony pelvis—abnormalities which give rise to occipito-posterior positions of the foetus and deep transverse arrest of the head. In the absence of such complications, however, the inertia is no doubt the result of the endocrine disturbance of which the adiposity and masculinity are other manifestations.

Some authorities go so far as to describe the syndrome of these patients as "dystocia dyspituitarism"—since it would appear that the pituitary gland is primarily to blame.

TABLE V.
Age and parity.

Parity			Age (years)	
Primiparae	68		16 to 20	5
Multiparae	19		21 to 25	15
1 previous pregnancy	9		26 to 30	26
2 previous pregnancies	2		31 to 35	25
3 ,, ,, ...	2		36 to 40	13
4 ,, ,, ...	1		41 to 45	3
5 ,, ,, ...	1		Age unknown ...	1
7 ,, ,, ...	2			
11 ,, ,, ...	1			
12 ,, ,, ...	1			
Parity unknown	1			
	88			88

2. *Local Disease of the Uterine Wall.*

Defects in the musculature such as under-development, maldevelopment, fibromyomata and scars are also reputed to cause inertia. In practice, however, it is rarely possible to ascribe disordered uterine action to such lesions.

If uterine development is sufficiently good to allow the implantation and growth of the pregnancy, it is sufficient to ensure good contractions in labour. Moreover, any under-development

present at the onset of pregnancy must inevitably be corrected by the processes of hormone stimulation and mechanical distension which are operative during pregnancy.

Gross malformations such as a bicornute uterus may give rise to malpresentations and even pathological adherence of the placenta, but rarely are they associated with feeble muscle contractions (*vide* Schultze[27]). The same is true of uterine scars as after Caesarean section and myomectomy. The details of 289 confinements in patients previously subjected to Caesarean section, recently reported by Langen,[28] fully support the view that scars do not cause inertia.

Recent and diffuse disease or injury to uterine muscle, as in abruptio placentae, are in a different category, however, and may, on occasion, render the muscle incapable of contraction.

3. *Over-distension of the Uterus.*

An over-stretched muscle is known to lose its power of contraction: hydramnios and multiple pregnancy are, therefore, said to cause inertia. Yet such conditions are usually associated with the premature onset of labour, which implies an over active rather than inert uterus. Moreover, in most cases of multiple pregnancy labour is rapid and not slow. This is partly due to the small size of the children but there is at least no evidence of uterine inefficiency. The recent accounts of the delivery of twins (Hirst[29]), quadruplets (Harrison[30]), quintuplets (Dafoe[31]) bear out in every case that the labours were rapid. For further evidence on this point I have investigated a series of 100 consecutive cases of twin pregnancy delivered in the Liverpool Maternity Hospital (see Table VI). Many of these were complicated by hydramnios. In multiparous patients, the average duration of labour was 9.1 hours, 42 out of 56 patients being delivered in less than 12 hours. Among primiparae the average duration of labour was 15.1 hours, 34 out of 44 being delivered in less than 18 hours. The duration of labour in these cases is well within the limits of time accepted for normal labour.

It is true that occasionally multiple pregnancy is complicated by inertia, 5 out of the 88 patients treated with oestrogenic hormone had twins. But it should be remembered that factors other than muscle stretching may be responsible. Thus malposition of the leading foetus or a small presenting head may result in inadequate stimulation of the birth canal.

The conception that over-distension of a uterus does not

directly produce inertia is in accord with the experimental work of Reynolds and Kaminester[32] who showed that not only does distension of the rabbit uterus cause hypertrophy but that the hypertrophy is proportional to the degree of distension and, moreover, takes place rapidly.

TABLE VI.

Analysis of labour in 100 *cases of multiple pregnancy.*

FIRST STAGE OF LABOUR.

Time (hours)	Primiparae	Multiparae	Total	Average time (hours)
0 to 6 ...	9	30	39	
6 to 12 ...	14	12	26	
12 to 18 ...	10	7	17	Primiparae = 12.3
18 to 24 ...	5	3	8	Multiparae = 7.8
24 to 30 ..	3	2	5	
30 to 36 ...	1	1	2	
Unknown ...	2	1 (rapid)	3	

SECOND STAGE OF LABOUR.

Time (hours)	Primiparae	Multiparae	Total	Average time (hours)
0 to 1 ...	12	38	50	
1 to 2 ...	15	13	28	
2 to 3 ...	7	2	9	Primiparae = 2.5
3 to 4 ...	4	1	5	Multiparae = 1.1
4 to 5 ...	2	0	2	
Over 5 ...	2	1	3	
Unknown ...	2	1	3	

TOTAL DURATION OF LABOUR.

Time (hours)	Primiparae	Multiparae	Total	Average time (hours)
0 to 6 ...	2	28	30	
6 to 12 ...	16	14	30	
12 to 18 ...	16	8	24	Primiparae = 15.1
18 to 24 ...	4	3	7	Multiparae = 9.1
24 to 30 ...	4	1	5	
30 to 36 ...	1	2	3	
36 to 42 ...	1	0	1	

TABLE VII.

Factors associated with inertia.

I. Inertia complicated by mechanical fault in the presenting part or passages ...		37	
Malposition or malrotation of the head	22		
Slight contraction of the pelvic inlet ...	3		
Hydrocephalus	3		
Contraction of pelvic outlet	2		
Extension of foetal head	1		
Impacted frank breech	1		
Rigid cervix after previous amputation	1		
High head due to faulty inclination of pelvic brim and minor degrees of pelvic malformation	4		
II. Inertia uncomplicated by mechanical faults		51	
No abnormality found	32	(premature rupture of the membranes in 7)	
Premature labour	5		
Multiple pregnancy	5		
Breech presentation	3		
Rigid cervix	2		
Elderly multiparous patients	2		
Antepartum haemorrhage	2		

4. *Mechanical Errors in the Relation of the Foetus to the Birth Canal.*

The importance of mechanical faults as a cause of inertia has already been emphasized and it only remains to observe that such faults were demonstrated in 37 out of 88 patients (42.1 per cent). The details are shown in Table VII.

Some writers, in considering uterine inertia, exclude all cases of disordered uterine action which are complicated by disproportion and allied conditions. This attitude is not only unscientific but is most difficult to adopt in practice. For both faulty uterine action and mechanical difficulty go to make the clinical picture, and the treatment of any patient necessitates taking account of both factors.

The intimate connexion between these two factors in dystocia cannot be denied, but the nature of the connecting link may be disputed. The view here put forward is that the inertia is reflexly caused by the mechanical obstacle. On occasion, however, the

faulty rotation of the head or its lack of engagement may be the result and not the cause of uterine atony.

Again, it is frequently stated that a mechanical fault causes inertia by fatiguing the uterine muscle. Exhaustion of the muscle undoubtedly occurs at times but it is not common. The occurrence of inertia, as a rule, does not bear any close relation to the amount of effort previously exerted by the uterus. It occurs in primiparae rather than in multiparae whose uteri have borne the strain of repeated confinements. The contractions of the uterus are adversely affected no matter whether the mechanical error arises at the beginning or end of labour and no matter whether the resources of the uterus have been lightly or heavily taxed previously. Nervous exhaustion is more important than muscle fatigue, in the etiology of inertia.

5. *Nervous Factors.*

The uterus is richly supplied with nerve fibres of the autonomic system, and the presence of these presupposes that they normally play some part in controlling uterine action. However, this part may not be an essential one, because in animals labour can take place spontaneously when all the nervous connexions of the uterus are interrupted, and in woman, the presence of a paraplegia does not interfere with the progress of parturition.

Nevertheless, nervous mechanisms may be involved in the causation of inertia. A full bladder and rectum reflexly inhibit uterine contractions: it is probable that faulty stimulation of the cervix, vagina and perineum by the presenting part also produces its effect on the upper uterine segment by a nervous route.

Some authorities believe that acetylcholine—the substance liberated at parasympathetic nerve endings—is of importance in bringing on labour and maintaining expulsive uterine contractions. It is, therefore, used, with some effect, in the treatment of inertia. The recent suggestion that oestrogenic substances bring about the liberation of acetylcholine in rabbits (Reynolds[25]) is interesting from this point of view.

Evidence so far available, however, goes to show that hormonic principles are much more vital to uterine action than are nervous stimuli.

6. *Emotional Factors.*

Time does not allow discussion of all the reputed causes of inertia but it would be wrong to omit reference to emotional

factors. Of these, fear is the most important, and it acts either through the liberation of adrenalin or through the autonomic nervous system. It is suggested that stimulation of the sympathetic fibres inhibits dilatation of the cervix and serves to inco-ordinate uterine action. In her first labour a woman is apprehensive of the unknown, and this may partly explain why inertia occurs more frequently in primiparae.

Cases of inertia due to emotional causes were excluded so far as possible from this series but I do not wish to minimize their importance or relative frequency. To this end I would emphasize that the administration of sedatives, such as morphia and chloral, still remains the best form of treatment and constitutes the first measure to be adopted in all cases of inertia. Moreover, such administration should not be unduly delayed.

Conclusion

Inertia is a wide subject and it has been necessary to confine these remarks to a few of its aspects only. Feeble uterine contractions alone have been considered whereas all derangements of uterine action which lead to inefficiency would be more properly grouped together. Conditions such as a rigid cervix, constriction ring, inco-ordination of muscle contractions, are all intimately related to weak and infrequent contractions. Indeed, periods of distressing spasmodic uterine action may be interspersed with periods of feeble contractions in the same patient (Phillips[33]). Moreover, similar states of disproportion may lead either to uterine inertia or to tonic contraction and rupture of the uterus.

Again, only one form of treatment has been examined. Valuable though it is, it should not be regarded in any light other than as an accessory measure. Morphia and other sedatives take first place in the treatment of uterine inertia, the use of the forceps is sometimes essential and Caesarean section may be indicated in special circumstances. When operative intervention is necessary, however, spinal or local anaesthesia is preferable to inhalation anaesthesia, if post-partum haemorrhage is to be avoided.

Oestrogenic hormone should be used in those patients in whom uterine action is not improved by sedatives and anti-spasmodics. It not only enhances the power of uterine contractions but also serves to regulate and co-ordinate them, and this latter effect is of the utmost importance. It is especially useful in the prophylactic treatment of inertia.

The technique of treatment as described here may require

modification as further knowledge of endocrinology is gained. Information regarding the fate of hormone after its injection is especially needed. As mentioned previously, the oestrogenic principles in circulation during pregnancy are mostly in an inactive state. This suggests the existence of some mechanism which is protective in so far that the hormone is prevented from sensitizing the uterus prematurely. If such a conception is true it may be that some cases of inertia are due to a persistence of this mechanism and any oestrogenic hormone administered will be inactivated and rendered useless.

The endocrinological viewpoint of uterine inertia is intriguing and is one into which investigations have only just commenced. Further inquiry will undoubtedly go far in helping to solve these mysterious disorders of uterine action. At the same time it is clearly not the only important aspect on the subject, the mechanical relation between the presenting part and the birth canal being of considerable account. This being so, every patient exhibiting feeble or irregular uterine contractions in labour should be regarded as suffering from an error in this relation until the most careful investigation has proved otherwise.

ACKNOWLEDGMENTS

The clinical work described here has been carried on for over 5 years in the Liverpool Maternity Hospital, and I am indebted to my colleagues on the Staff of this hospital for permission to carry out hormone therapy on their patients and for allowing me to report the results.

I wish also to express my thanks to the resident medical officers and to Sister D. Gill and her labour ward staff, for their willing and interested co-operation at all times.

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Production of Uterine Haemorrhage in the Normal Cycle and in Amenorrhoea through Progesterone

BY

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WHILE investigating the mechanism of menstrual bleeding, which one of us (B.Z.) has been studying for several years, the question arose whether the corpus luteum hormone is able to bring about bleeding even if the uterine mucosa has previously been developed either incompletely, or not at all, by means of follicular hormone. The investigations produced the striking result that the corpus luteum hormone is able to induce haemorrhage in normally menstruating and non-menstruating women (amenorrhoea).

I

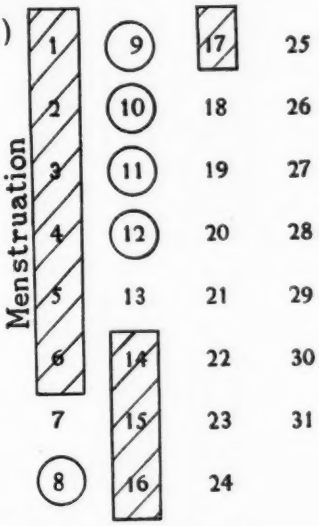
HAEMORRHAGES INITIATED BY PROGESTERONE DURING THE NORMAL CYCLE OF WOMEN.

Women with a normal cycle were treated for 5 days during the post-menstrual stage with 10 milligrams of progesterone daily. After an interval of 2 to 3 days, bleeding lasting from 2 to 6 days occurred. Progesterone treatment, therefore, during the post-menstrual stage induced a haemorrhage in the intermenstruum which, with regard to strength and duration of the bleeding, appeared exactly like a menstrual bleeding. The subjective symptoms, too, were the same as those of menstruation. During the progesterone treatment the patients felt that the breasts were swollen and painful and also complained of abdominal pains; all these troubles, however, disappeared as soon as the bleeding set in. The blood which was discharged did not coagulate, a property characteristic of menstrual blood. In the following paragraphs these cases are concisely described:

CASE NO. 1. S.L., 36 years of age, married for one year, sterile. Menstruation had always been regular, with an interval of 30 days, and had lasted for 6 days.

The last menstruation had been from February 28th to March 5th. From the 7th to the 11th of March, i.e. from the eighth to the twelfth day of the cycle, the patient was given 10 milligrams of progesterone intramuscularly daily,* thus she received a total of 50 milligrams. During the treatment the patient complained of swelling and pain in the breasts. During the night of the 12th to the 13th of March, i.e. 40 hours after the last injection, bleeding set in and persisted until March 16th, i.e. from the fourteenth to the seventeenth day of the cycle (Fig. 1).

Fig. 1)



○ = 10 mg. of progesterone.
▨ = haemorrhage.

CASE NO. 2. N., 22 years of age, sterile. Menstruation had always been normal, with an interval of 28 to 30 days, and had lasted for 5 to 7 days. There was dysmenorrhoea.

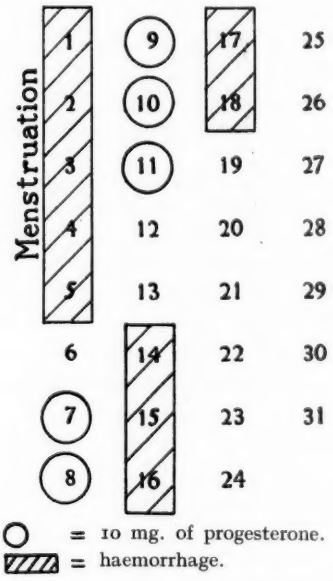
The patient had been under our treatment for a considerable time because of sterility. A piece of the uterine mucosa removed before menstruation showed the picture of the premenstrual stage with normal glycogen content. The last menstruation had been from the 22nd to the 26th of March 1938.

(*a*) From the 28th of March to the 1st of April 1938, i.e. from the seventh to the eleventh day of the cycle, the patient received 10 milligrams

* We used progestin of Organon (Oss, Holland). We are greatly indebted for the kind supply of the preparation.

of progesterone daily, making a total of 50 milligrams. During the treatment the breasts were enlarged, there was backache and considerable vaginal discharge. On the 4th of April, i.e. on the fourteenth day of the cycle, a strong haemorrhage set in, while the subjective troubles subsided. The interval between the last progesterone injection and the onset of the bleeding was 60 hours. The bleeding lasted for 5 days, i.e. from the fourteenth to the eighteenth day of the cycle. (Fig. 2.)

Fig. 2)

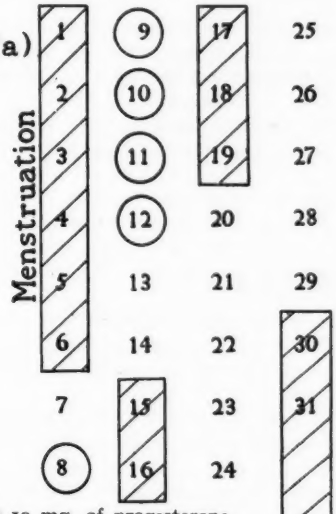


In this case, therefore, progesterone had brought about bleeding in the intermenstrual stage which, with regard to duration and the amount of blood lost, was absolutely similar to the menstrual bleeding which was customary for the patient.

(*b*) In June 1938 a similar course of treatment was given. Menstruation took place from the 21st to the 25th of June. From the 27th of June to the 1st of July, i.e. from the eighth to the twelfth day of the cycle, the patient received a total of 50 milligrams of progesterone. The subjective troubles were similar to those of the first course. This time, too, after an interval of 60 hours, bleeding set in which persisted from the fifteenth to the nineteenth day of the cycle. (cf. Fig. 2*a*.)

Eleven hours after the onset of the bleeding a piece of the uterine mucosa was removed for biopsy. Histological examination had the following result: the appearance of the mucosa corresponded to the end

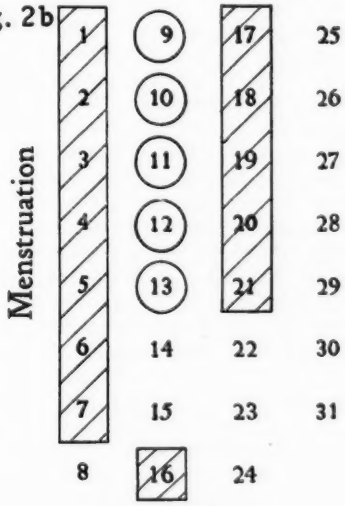
Fig. 2a)



○ = 10 mg. of progesterone.

▨ = haemorrhage.

Fig. 2b



○ = 10 mg. of progesterone.

▨ = haemorrhage.

of the intermenstrual phase. The glands were already somewhat tortuous and, partly, contained secreted material.

In this case it was important that on the thirtieth day of the cycle, i.e. the date of the expected menstruation, bleeding recurred and persisted for 5 days.

(*c*) A similar treatment was given in July 1938. Menstruation took place from the 20th to the 26th of July. Subsequently the patient received, from the 28th of July to the 1st of August, i.e. from the ninth to the thirteenth day of the cycle, 10 milligrams of progesterone daily for 5 days. After an interval of 67 hours bleeding set in on the 4th of August (sixteenth day of the cycle) and persisted for 6 days. (cf. Fig. 2*b*.) An hour and a half after the onset of the bleeding a strip of uterine mucosa was removed for biopsy.

The glands, in the main, were small and round, though some of them were tortuous like a corkscrew and contained some secretion, but no glycogen. The picture of the mucosa corresponded to the end of the intermenstrual stage.

In this case (2*b*) pseudo-menstruation, artificially brought about by means of progesterone in the intermenstruum, did not disturb the course of the normal cycle, so that on the thirtieth day of the cycle another bleeding of 5 days duration occurred. We can assume that this was the menstrual period to be expected in this cycle. The type of haemorrhage, however, could not be definitely determined, since, unfortunately, biopsy of the uterine mucosa had been omitted.

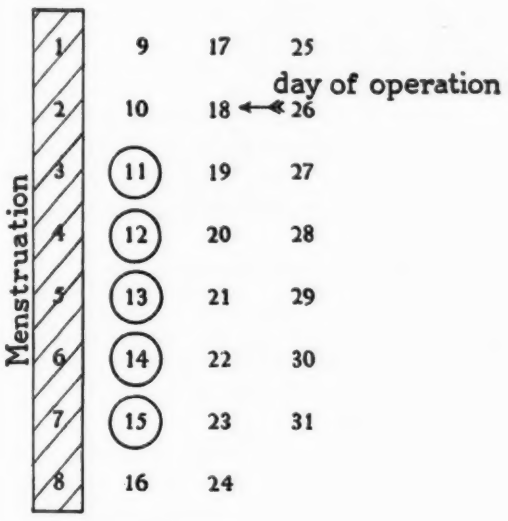
Case No. 3. R.B., 36 years of age. Menstruation occurred every 4 weeks and lasted for 3 to 4 days. During the last year menstruation had become more severe and lasted for 6 to 8 days, the intervals, however, being still regular. The patient had a large myoma reaching up to the umbilicus, with a large retrocervical tumour. In this case, which presented an absolutely normal cycle in spite of the presence of a myoma, progesterone treatment was given in the post-menstrual stage to enable us to ascertain the haemorrhagic effect of progesterone at the operation. The last menstruation had been from the 21st to the 28th of May. From the 31st of May to the 4th of June, i.e. from the eleventh to the fifteenth day of the cycle, the patient received 10 milligrams of progesterone daily, i.e. a total of 50 milligrams. The interval between the last progesterone injection and the onset of the bleeding being, as a rule, 60 hours, bleeding could be expected to occur during the evening of the 7th of June, i.e. on the eighteenth day of the cycle. On this day operation was performed at 9 a.m., about 12 hours before the moment when bleeding was expected (supravaginal amputation of the uterus) (cf. Fig. 3). The uterine cavity had not been deformed by the tumours. The hyperaemia of the mucous membrane of the fundus was striking. In the lateral areas, i.e. near the tubal orifices blood-spots were seen with the naked eye.

*Microscopic examination.** The mucous membrane of the uterine

* We are greatly indebted to Prof. Dr. Getzova, Director of the Pathological Institute of the Rothschild-Hadassah-Hospital, Jerusalem, for the anatomical examination.

body was considerably thickened, the glands had grown longer, were partly tortuous, and had wide lumina. Best's glycogen stain showed large masses of glycogen in the lumina of the glands and fine drops of glycogen in the epithelium. There were frequently bigger masses of glycogen immediately above the epithelium.

Fig. 3)



○ = 10 mg. of progesterone.
▨ = haemorrhage.

Hemalum-eosin stain revealed that the lumina of the glands were partly empty, partly copiously filled with blood, and this was particularly so with the glands situated near the lumen. The blood filled the orifices of the glands and from there oozed into the uterine cavity.

Moreover, there were scattered haemorrhages in the interstitium and masses of blood beneath the surface epithelium. The blood-vessels were dilated and filled with erythrocytes.

Within the epithelium of the glands there were not infrequently translucent clefts between the epithelial cells which presented breaks of continuity; furthermore, there were smaller defects, the missing epithelial parts, however, were found in the lumina of the glands. Extensive epithelial desquamation was found in connexion with the larger glands. The surface epithelium of the uterine mucosa, too, showed epithelial lesions.

In this case we were successful in getting an insight into the condition of the uterine mucosa through operation inmmediately before the onset of

the visible uterine bleeding. Even to the naked eye the fundus showed hyperaemia and blood-spots. Microscopic examination revealed that the blood was just about to enter the uterine cavity. While in the former cases we discontinued progesterone treatment on the eleventh or twelfth day of the cycle, the progesterone administration in this case was not discontinued before the fifteenth day. The patient having a 28-days cycle, we can assume that ovulation had occurred approximately on the fourteenth day of the cycle. This was proved by the fact that on the day of operation (eighteenth day of the cycle) the right ovary showed a well-developed corpus luteum. On the fourteenth and fifteenth days of the cycle progesterone had been given. During both these days the patient had been under the influence of progesterone, produced endogeneously in the corpus luteum, as well as the hormone which had been administered parenterally. This progesterone effect, increased beyond the physiological measure, hastened the development of the uterine mucosa, so that on the eighteenth day of the cycle we encountered a mucosa of marked progestational type. In this case we had, therefore, experimentally produced precocious uterine bleeding of menstrual type.

Bleeding cannot be induced in every case in which progesterone is administered in the period of the follicular rupture during the intermenstruum. One patient who had been injected daily with 10 milligrams of progesterone from the twelfth to the sixteenth day of the cycle did not show any deviation from the normal menstrual cycle: that means menstruation appeared on the twenty-seventh day.

Results. If progesterone is administered to normally menstruating women for 5 days during the post-menstrual stage (seventh to twelfth day of the cycle) bleeding of several days duration occurs after an interval of 60 hours on the fourteenth day of the cycle. Since the uterine mucosa, in this stage, does not show any, or only the beginning, of the secretory stage, this haemorrhage can be looked upon as pseudo-menstruation. The normal ovarian cycle need not be disturbed by this event. Another bleeding can occur within the same cycle.

If progesterone is administered at the time of the follicular rupture, at a moment when the patient has her own corpus luteum, bleeding either does not occur at all or there is a haemorrhage from a mucous membrane already developed into the premenstrual stage. In this case precocious menstrual bleeding can be induced.

Treatment of Amenorrhoea with Progesterone.

It was the subject of further investigations whether haemorrhages can be initiated in patients suffering from amenorrhoea by

treating them exclusively with progesterone, i.e. without preliminary treatment with follicular hormone.

We considered 5 cases of primary amenorrhoea between 22 and 34 years of age. The patients received 10 to 20 milligrams of progesterone daily for 5 days. Four of the patients received a total of 50 milligrams and one of them 100 milligrams. This progesterone treatment proved to be ineffective, i.e. bleeding did not occur. (cf. Table I.) Among 8 cases of secondary amenorrhoea, however, in which the condition had persisted from 4 months to 3 years, we succeeded 7 times in initiating a haemorrhage from $2\frac{1}{2}$ to 9 days duration. The patients took this haemorrhage in every respect for menstruation. The subjective troubles which had previously been present instantly improved. The blood taken from the uterus did not coagulate. In the following we are going to describe these cases concisely:

Case No. 1. J., 21 years of age. Menstruation had been regular until 4 months previously, when amenorrhoea began. The gynaecological findings were normal. From the 31st of January to the 4th of February 1938 the patient was given 10 milligrams of progesterone daily; thus she received a total of 50 milligrams. During the treatment the patient complained of dragging pain in the breasts. On the 8th of February, i.e. during the night of the third day subsequent to the last progesterone injection, a haemorrhage came on which persisted for 4 days. In the subsequent months the patient again suffered from amenorrhoea.

Case No. 2. S., 23 years of age. Menstruation had always been regular, until 6 months previously, when amenorrhoea began. The gynaecological findings revealed that the uterus was acutely anteflexed, the body was narrow—the length of the uterus was 7 centimetres. From the 11th to the 16th of April 1938 the patient was given 10 milligrams of progesterone daily; thus she received a total of 50 milligrams. During the course of treatment she perceived particularly large swelling of the breasts, which were sensitive to pressure. In addition she had backache and pain in the abdomen. Two and a half days subsequent to the last progesterone injection bleeding set in and persisted for 3 days. The blood loss was remarkable. During the following months there was not any spontaneous haemorrhage.

Case No. 3. W., 26 years of age. Nine months previously a curettage post-abortum had been performed, and since that time the patient had suffered from amenorrhoea. The uterus was retroflexed and 6.5 centimetres long. From the 17th to the 21st of April the patient was given 10 milligrams of progesterone daily. After an interval of 9 days bleeding set in and persisted for 2 days. On the 6th of June and on the 4th of July spontaneous bleeding occurred. In this case amenorrhoea of 9 months standing had been cured by progesterone treatment.

CASE NO. 4 AND 5. F., 24 years of age. Menstruation had formerly been regular, but now there was amenorrhoea of 10 months standing. The uterus was anteflexed and the corpus uteri was somewhat narrow. Its length was 7 centimetres. The patient was obese. From the 22nd to the 25th of February 1938 the patient received 10 milligrams of progesterone daily. She complained of very severe pain in the abdomen, back, and breasts, and of vaginal discharge. Three days after the last injection bleeding set in, persisting for 3 days with remarkable loss of blood.

During March and April the patient did not receive any treatment at all, the amenorrhoea persisting. A new course of treatment was given from the 1st to the 5th of May. The total dose was 50 milligrams of progesterone. Three days after the last injection, exactly as in the first course, a remarkable haemorrhage set in, persisting for 3 days.

CASE NO. 6. M., 37 years of age. The patient had had 2 children. Menstruation had formerly been regular; for 15 months, however, there was amenorrhoea. The uterus was of normal size, 7.5 centimetres long, and the corpus was somewhat narrow. From the 8th to the 12th of May 1938 the patient received 10 milligrams of progesterone daily. Two and a half days subsequent to the last injection bleeding set in and persisted for 3 days. In this case we removed a strip of the uterine mucosa for biopsy 15 hours after the onset of the bleeding. The mucous membrane was thin, and even to the naked eye corresponded to the intermenstrual stage; and this was confirmed by histological examination. The glands, with regard to their structure, corresponded approximately to the fifteenth day. Some of the glands were somewhat tortuous; 2 of them were filled with blood.

In this case the patient had a spontaneous bleeding on the 20th of June as well as on the 10th of July and on the 1st of August. Amenorrhoea of 15 months standing, therefore, had been cured by progesterone treatment, in such a manner that in the subsequent months spontaneous bleeding occurred. It was not, however, a menstrual but a pseudo-menstrual haemorrhage we had to deal with. A strip of the mucous membrane taken out on the first day of bleeding in July and August showed progestational (premenstrual) growth of the mucous membrane to be missing.

CASE NO. 7. G., 41 years of age. Menstruation had formerly been normal; for 2 years, however, there was amenorrhoea. The last menstruation had been in April 1936. In this case we were not successful in initiating bleeding through progesterone treatment.

CASE NO. 8. D., 23 years of age, not married. Menstruation had formerly been normal until, 3 years previously, amenorrhoea had begun. The uterus was acutely anteflexed and 8 centimetres long. From the 27th to the 31st of May 1938 the patient received 10 milligrams of progesterone daily. On the 4th of June, i.e. after an interval of 3½ days, bleeding set in and persisted for 1½ days. Unfortunately we are not able to say whether the patient had spontaneous haemorrhages later because she evaded our treatment.

The above cases demonstrate that 5 days treatment with progesterone can produce haemorrhage in secondary amenorrhoea without preliminary treatment with follicular hormone. In primary amenorrhoea, however, this manner of treatment fails.

Progesterone and Pregnancy.

Since it had become evident that progesterone could induce haemorrhage in the normal as well as in the disturbed ovarian cycle, we tried to initiate haemorrhage during pregnancy in order to bring about abortion in this way. We used doses of 50 to 150 milligrams of progesterone. Bleeding, however, did not occur and pregnancy continued.

Case No. 1. S., 35 years of age. The patient had severe cardiac disease (mitral stenosis and incompetence with beginning decompensation). She had been transferred to our department from the Department of Medicine for the purpose of interrupting pregnancy. The patient was in the sixth week of pregnancy. She received 10 milligrams of progesterone daily for 5 days without any bleeding occurring during the following 10 days. Thereupon we interrupted the pregnancy.

Case No. 2. K., 20 years of age. The patient suffered from severe cardiac disease (mitral stenosis and incompetence with beginning decompensation) and was transferred to our department from the Department of Medicine for the purpose of interrupting pregnancy.

First treatment. The patient received 10 milligrams of progesterone daily from the 22nd to the 27th of June 1938.

Second treatment. The patient received 20 milligrams of progesterone daily from the 3rd to the 7th of July 1038, i.e. a total of 100 milligrams. In spite of 150 milligrams having been administered, bleeding did not occur.

Discussion.

In the normal cycle of the woman during the first generative phase proliferation of the uterine mucosa is brought about by means of follicular hormone. In the second generative phase the uterine mucosa is functionally transformed by means of progesterone. Haemorrhages originating from the proliferative mucosa are called pseudo-menstruation, those originating from a mucosa which has been progestationally transformed are called menstruation. When treating amenorrhoea we imitate these conditions firstly by inducing growth of the uterine mucosa through oestrogenic hormone and subsequently administering corpus luteum hormone for several days. The above investigations had

the striking result that in cases of secondary amenorrhoea preliminary treatment with oestrogenic hormone was not necessary to achieve the bleeding. The haemorrhages—initiated by progesterone alone—originated from a mucous membrane which corresponded approximately to the intermenstrual stage. The duration and the severity of the haemorrhage, as well as the alleviation of the subjective troubles, were absolutely equivalent to those of menstruation. Progesterone treatment fails in cases of primary amenorrhoea. There is, therefore, a characteristic difference between these two types of amenorrhoea. We have previously obtained similar results. In primary as well as secondary amenorrhoea the excretion of prolan A into the urine[1] is increased. If pseudo-menstruation or menstruation is induced in women with amenorrhoea through hormone treatment, the increased prolan A excretion can be easily made to disappear in secondary amenorrhoea, while this is very difficult in primary amenorrhoea.[2] The question must be discussed why in primary amenorrhoea progesterone treatment does not meet with success. The reason, perhaps, is that in primary amenorrhoea the mucous membrane is atrophic, while in secondary amenorrhoea a certain amount of proliferation of the uterine mucosa is present. This would indicate that in primary amenorrhoea the production of follicular hormone is lacking, while in secondary amenorrhoea secretion is under the threshold.—In 8 cases of secondary amenorrhoea, which had been treated, one course of progesterone treatment could cure the amenorrhoea in 2 cases, whereas, however, the cyclic haemorrhages appearing in the subsequent months were not menstruations, but pseudo-menstruations. This favours the assumption that in these 2 cases the production of follicular hormone had been raised from below the threshold to a normal level. Moreover, we can conclude that in these cases progesterone stimulates the anterior pituitary, causing increased secretion of the follicle-ripening hormone (prolan A), which, in its turn, secondarily induces increased production of follicular hormone.

The fact is of importance, moreover, that we are also able to induce uterine haemorrhages in the normal cycle at random. It is possible artificially to produce pseudo-menstruation, persisting for several days, in the intermenstrual stage. If from the seventh to the eleventh day of the cycle progesterone is injected, bleeding sets in on the thirteenth or fourteenth day of the cycle. Thus we inject progesterone at a moment when the uterine mucosa is just beginning to grow, and even at this time progesterone is able to

exert its haemorrhagic effect. It follows from this that, for the purpose of initiating bleeding, through progesterone, the prerequisite condition is not a progestationally developed mucous membrane, but that the effect of progesterone can also take place in a proliferative mucous membrane, or even in a mucous membrane which has only partially developed proliferatively.

Pseudo-menstruation artificially produced during the intermenstrual stage need not disturb the further course of the cycle, for at the expected date of the menstruation another haemorrhage of several days duration can occur.

If progesterone is injected at a time when the patient is already under the influence of the progesterone which has been formed endogenously in the corpus luteum, on the eighteenth day of the cycle bleeding originating from a mucous membrane almost progestationally developed can take place, or there is not any bleeding at all.

As demonstrated by former investigations,[3] large doses of follicular hormone administered within the cycle can prevent the following menstruation, thus artificially bringing about amenorrhoea. The above investigations make it evident that we are able to achieve intracyclic haemorrhages of several days duration by means of corpus luteum hormone given during the cycle.

The importance of these findings for the mechanism of menstruation will be dealt with elsewhere.

Summary.

1. Progesterone administration during the post-menstrual stage can bring about pseudo-menstruation in the intermenstrual stage (intracyclic haemorrhage).

2. By progesterone administration in the intermenstrual stage precocious menstrual bleeding can be brought about.

3. In secondary amenorrhoea progesterone can induce bleeding. Preliminary treatment with oestrogenic hormone, therefore, is unnecessary for the treatment of secondary amenorrhoea.

4. In some individual cases of secondary amenorrhoea it is possible to start the cycle working through progesterone treatment.

5. In primary amenorrhoea progesterone treatment fails.

6. During pregnancy bleeding cannot be initiated by progesterone.

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TABLE I.

Progesterone treatment in primary amenorrhoea.

No.	Name	Age	Findings	Present treatment with progesterone	Result
1	S.	22	Uterus markedly atrophic.	Five times 10 mg. of progesterone = 50 mg.	——
2	A.	28	Secondary sexual signs present; uterus 4 cm. long.	Five times 10 mg. of progesterone = 50 mg.	——
3	A.R.	30	Uterus very small; 5 cm. long.	Five times 20 mg. of progesterone = 100 mg.	——
4	H.	31	Uterus small and narrow; 6 cm. long.	Five times 10 mg. of progesterone = 50 mg.	——
5	B.N.	34	Uterus retroflexed, small; 6.5 cm. long.	Five times 10 mg. of progesterone = 50 mg.	——

TABLE II.

Progesterone treatment in secondary amenorrhoea.

No.	Name	Age	Duration of the amenorrhoea	Gynaecological findings	Progesterone treatment	Haemorrhage	Duration of the haemorrhage (days)	Interval between last menstruation and haemorrhage (days)
1	J.	21	4 months	Normal.	Ten milligrams daily for 5 days.	+	3½	3
2	S.	23	6 months	Uterus anteflexed; 7 cm. long.	,,	+	3	2½
3	W.	26	9 months	Uterus retroflexed; hypoplastic; 6 cm. long.	,,	+	2	9
4	F.*	24	10 months	Uterus anteflexed; 7 cm. long.	,,	+	3	3
5	F.†	24	12 months	——	,,	+	3	Almost 3
6	Mi.	37	15 months	Uterus normal; 7.5 cm.	,,	+	3	2½
7	G.	41	2 years	Uterus anteflexed; normal length.	,,	——	——	——
8	D.	23	3 years	Uterus hyperanteflexed; corpus narrow; 8 cm. long.	,,	+	2	3

* First treatment. † Second treatment.

A Study of Abortion Sequences

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ABORTION and stillbirth sequences fall into two main groups. They may be caused on the one hand by some condition inimical to the growth of the foetus recurring in each pregnancy. On the other hand, the succession may be due to the unfortunate incidence in successive pregnancies of chance or casual causes alone. In any examination of the causes of an abortion sequence it is therefore necessary to consider at the outset the part played by recurrent and random factors respectively. Under the exigencies of practice and faced with the difficulties of determining the cause there is a natural tendency to consider all cases of successive abortion as instances of a well-defined syndrome, the "habitual abortion syndrome." The use of such a term is undesirable because it implies that these cases form a single, well-defined aetiological group, amenable to a single therapy. If the terms "sequential abortion" or "abortion sequences" are used, such unwarranted suppositions are not implied.

A large number of pregnancies ends in abortion. Whitehouse[1] gives a figure of 17.6 per cent of all pregnancies. Mall's[2] figure is 20 per cent. In the population from which the material for this paper was drawn the percentage of pregnancies ending in abortion was 18. To obtain this figure of 18 per cent 2,000 fraternities were examined, in the great majority of which only one abortion occurred. Most abortions must accordingly be regarded as due to non-recurrent causes such as trauma, infections, transient metabolic and endocrine disturbances, faults in the implantation site of the embryo. Otherwise cases of sequential abortion would be far more common than they are.

An incidence of abortion as high as 18 per cent will nevertheless give an appreciable number of cases of sequential abortion due to the chance incidence in succession of these accidental or random causes alone without involving any recurrent factors at

all, and, therefore a closer analysis of the problem becomes necessary.

Let us assume we are dealing with 100 women pregnant for the first time and that the incidence of abortion from casual or accidental causes is 20 per cent. Twenty of these women will abort for some cause or other. If these 20 women become pregnant again, 20 per cent will abort a second time, i.e. 4 women out of the 100 will have 2 successive abortions as a result of chance causes alone. With a larger population there will be many women who will have 3 or 4 successive abortions from the operation of random factors alone. The first step, therefore, in the problem is to determine how to segregate cases of abortion sequence in which a recurrent factor is present from the accidental cases. Expressed differently, the question is how many abortions must a woman have before we can reasonably infer the presence of a truly recurrent cause?

The problem may be dealt with in the following way. Let us assume that some abortion sequences are due to truly recurrent causes. Then of 100 women becoming pregnant for the first time a certain number (x) will abort because of non-recurrent causes, a certain number (y) because of recurrent causes. If those women who have aborted once, i.e. $x+y$, become pregnant for the second time, those in whom a recurrent factor is present (y) will abort again, the others (x) will still be subject to the chances of accidental abortion and some of them will have a second abortion, although persistent cause is not present. In a similar manner the chances of three or more abortions occurring in sequence can be worked out simply.

Table I shows the incidence of abortion when various arbitrary values are assigned to the percentage of abortions due to casual causes and the percentage due to recurrent causes.

The table shows that the total number of abortions becomes almost constant after the third abortion, whatever arbitrary values are assigned to the non-recurrent and recurrent proportions. After three or more abortions the random causes produce a negligible number of further abortions.

It shows that the occurrence of three or more successive abortions is almost certain evidence that the sequence is due to recurrent causes, or in other words after a woman has had three abortions she may be regarded as a segregated habitual aborter. If a high value is assigned to the proportion of abortions due to recurrent factors, as in Column 1 of the table, in which 8 per cent of all pregnancies are assumed to end in abortion for recurrent

causes, segregation will be seen to be almost complete after the second successive abortion.

TABLE I.

Let x be the percentage of pregnancies ending in abortion from non-recurrent causes.

Let y be the percentage of pregnancies ending in abortion from recurrent causes.

Then $x+y=18$ per cent in the population under review.

Of 100 women becoming successively pregnant we may expect the successive pregnancies to end in abortion in the following proportions, assigning various arbitrary values to x and y:—

		Column I $x=10$ $y=8$		Column II $x=16$ $y=2$		Column III $x=17$ $y=1$	
	Total number of abortions	Number of abortions	Spontaneous cure-rate (per cent)	Number of abortions	Spontaneous cure-rate (per cent)	Number of abortions	Spontaneous cure-rate (per cent)
One abortion ...	$x+y$	18.0	—	18.0	—	18.0	—
Two successive abortions ...	$\left(x\times\frac{x}{100}\right)+y$	9.0	50.0	4.56	74.7	3.89	78.4
Three successive abortions ...	$\left(\frac{x^2}{100}\times\frac{x}{100}\right)+y$	8.18	9.0	2.41	47.0	1.48	62.0
Four successive abortions ...	$\left(\frac{x^3}{10^4}\times\frac{x}{100}\right)+y$	8.02	7.0	2.06	14.6	1.08	27.0
Five successive abortions ...	$\left(\frac{x^4}{10^6}\times\frac{x}{100}\right)+y$	8.002	0.3	2.01	3.0	1.013	6.0

It becomes therefore of paramount importance to determine even approximately the proportion of abortions due to recurrent factors, i.e. the value to be assigned to y. If the figures given in the table under the headings "spontaneous cure-rate" be examined, it will be seen that the spontaneous cure-rate, by which is meant the likelihood of the next pregnancy continuing to term without any treatment, is closely bound up with the value of the recurrent proportion. With a high value (Column 1) the spon-

taneous cure-rate is low, and with a low value (Column III) the rate is high. If the results of any therapy are to be assessed correctly, this question of the spontaneous cure-rate must receive full consideration.

The approximate number of abortions due to recurrent factors may be ascertained indirectly in the following ways.

The table shows that segregation of truly recurrent cases may be assumed to be almost complete after three successive abortions and that after this number of abortions has occurred, the number of women continuing to abort approximates closely to the proportion assigned to recurrent factors. In the population on which this paper was based, the percentage of women with three or more abortions was under 1 per cent. We may thus conclude that if the general abortion incidence is 18 per cent, then of every 100 pregnant women approximately 17 will abort for casual and random causes, and approximately 1 because of the pressure of a recurrent cause.

That this is a fair approximation to the value to be given to the percentage of abortions due to a recurrent factor is shown by the fact that in Column 3 of Table I, i.e., where a value of 1 is assigned to the recurrent proportion, the proportions between the numbers of women with 1, 2, 3 or more successive abortions approximate closely to the proportions of these women in the very extensive series described by Sir Beckwith Whitehouse[1] in the paper already referred to. I have utilized some of his data to construct the following table (Table II).

I have only utilized those of Whitehouse's figures which deal with nullipara, 1-para, 2-para, and 3-para, as further pregnancies would be avoided by most women with more than three living children, once a chain of abortions had commenced.

TABLE II.

Taken from Beckwith Whitehouse's data.

	Observed	Expected*
Number of patients with 1 abortion	180	180
,, ,, ,, ,, 2 successive abortions ...	43	39
,, ,, ,, ,, 3 ,, ,, ...	21	15
,, ,, ,, ,, 4 ,, ,, ...	7	11
,, ,, ,, ,, 5 ,, ,, ...	6	10
,, ,, ,, ,, 6 ,, ,, ...	4	10

* Taken from Table I, column 3. $x=17$, $y=1$.

It will be seen that there is a rough correspondence between the observed figures, except after 4 abortions. The disparity between the observed and expected figures after 4 abortions may be attributed to the operation of such factors as contraception, maternal ill-health, reduction of fertility due to increasing maternal age.

If recurrent causes cause abortion in 1 per cent of all pregnancies and non-recurrent causes in 17 per cent, it will be seen from Column 3 of Table I that the spontaneous cure-rate of abortion sequences is high. Even after a woman has had three successive abortions the chances of her continuing to term in the fourth pregnancy are 27 per cent, whether anything is done for her or not.

There is one further point before leaving this aspect of the problem. Even if by some specific therapy the recurrent causes of abortion could be removed, the treated patients would still be subject to the various casual factors which produce abortion, factors influencing about 17 per cent of all pregnancies, so that the very best results that could be obtained from any specific therapy are about 83 per cent. Results better than this prove too much.

It must be repeated that in the foregoing analysis the value given to y, the unknown proportion of recurrent abortions, does not denote the value of any specific recurrent factor: it only denotes the proportion of segregated recurrent aborters in the population. All that the analysis does is to provide a method whereby the truly recurrent cases can be isolated for individual study and to supply data for the assessment of the results of treatment.

In the present inquiry there were 115 abortion and stillbirth sequences available for study, occurring in a total of about 6,000 pregnancies which came under supervision. It seemed desirable to include cases of sequential stillbirth, excluding of course those cases due to recurrent birth trauma, because stillbirths tend to follow or be intercalated in most abortion sequences, and both abortions and stillbirths may have similar causes. Such a view is tacitly assumed in most papers which deal with the treatment of recurrent abortion.

Of these 115 women, 84 had had three or more consecutive abortions or stillbirths. Thirty-one had had but 2 consecutive abortions and these did not fall into the category of the segregated recurrent aborters. Because the present inquiry was concerned

with the causation rather than the treatment of abortion, it seemed advisable to include them in the review. The series did not include cases in which a number of abortions or stillbirths occurred in fraternities in alternation with normal living children.

An initial survey of the 115 cases showed that they could be divided into two groups, one group numbering 49, or 43 per cent, in which no evident cause for the sequence could be discerned, a second group numbering 66, or 57 per cent, comprising those cases in which abnormal features could be discerned.

The abnormal features exhibited by this group are shown in the following table:—

TABLE III.

Abnormal factors present in 66 abortion and stillbirth sequences.

	Number	
Developmental faults		
Twinning	8	
Triplets	1	
Malformations	9	
	—	18
Hereditary or familial factors	2	
	—	2
Maternal lesions		
Chronic nephritis	—	
Recurrent toxaemia	—	
Recurrent accidental haemorrhage	20	
	—	20
Chronic maternal diseases	4	
Syphilis	5	
Poor maternal health and anaemia	8	
Initial obstetric trauma	9	
	—	26
	Total	66

Each of these groups may now be considered separately.

Twinning and Malformation.

In the 115 fraternities exhibiting recurrent abortion, there were 9 instances of twins or triplets, a proportion of 1:12.8. In the population from which the cases were drawn, the proportion of families containing a twin pregnancy was 1:26.

A typical fraternity illustrating the point is the following :—

> Case No. 67. Twenty-seven years of age. First pregnancy: abortion at the second month. Second pregnancy: premature stillbirth. Third pregnancy: abortion. Fourth pregnancy: full-time stillbirth. Fifth pregnancy: living twins (no treatment during pregnancy).

This high incidence of twins in the fraternities suggests that the factors determining twinning are also concerned with recurrent abortion. The twins in the series were not all of similar sex and therefore the association of twinning with recurrent abortion does not concern uniovular twinning alone. It seems a reasonable conclusion that the abortions in these fraternities were due to recurrent developmental faults, of which twinning was but another manifestation. If this is so, then in abortion sequences of this type the causes operate so early in pregnancy that effective treatment will seldom be possible. Even binovular twinning, which arises at the phase of gastrulation and before the appearance of the primitive streak, is established by the tenth day of development. The foetus has passed the critical gastrulation stage before the first missed period.

The question of twinning is closely bound up with that of malformation of the foetus.

Foetal Malformations.

Among the 310 viable children born in the fraternities containing the abortion sequences, there were 9 instances of foetal malformations. The incidence of malformations among the abortions could not be determined. This gives a malformation incidence of 2.9 per cent for foetûs past the twenty-eighth week of pregnancy.

With the exception of 1 case of hare-lip, all the malformations which occurred were cerebrospinal, mostly spina bifida, anencephaly and hydrocephaly. In the population from which the cases were drawn, the incidence of these cerebrospinal malformations was 1.01 per cent, so that there was twice the normal incidence of these lesions in the affected fraternities. The importance of maldevelopment as a cause of abortion is well recognized, and many cases of recurrent abortion are certainly instances of recurrent malformation. The fact that the malformations noted were cerebrospinal is important, because it is these lesions which are particularly dependent upon modifications of the early environment of the embryo.

Familial Factors.

Excluding three instances of the familial incidence of nephritic toxaemia leading to recurrent abortion, which will be considered in a separate paragraph, there were two cases of sequential abortion in which a familial incidence of abortions or malformations occurred. The details of these cases were as follows:—

CASE NO. 94. First pregnancy, 1936: male, 6 pounds; lived 9 days. Second pregnancy: abortion. Third pregnancy: abortion on 4th December 1937. No cause was found for the abortion or stillbirth.

The patient's mother had had 16 children, only 4 surviving birth or infancy. One sister of the patient had had 3 stillbirths, followed by 3 living children. A second sister has 2 living children out of 8 pregnancies. The patient's only brother has always been delicate. He has had 3 children, 2 healthy and 1 born with an imperforate anus.

CASE NO. 110. Thirty-three years of age. First pregnancy, 1925: abortion at 4½ months. Second pregnancy, 1929: abortion at 5½ months. Third pregnancy, 1932: abortion at the fifth month. Fourth pregnancy, 1933: premature female, 1¼ pounds; lived 30 weeks. Fifth pregnancy, 1934: abortion at the fourth month. Sixth pregnancy, 1935: premature male, 2 pounds; died. Seventh pregnancy, 1936: abortion at the twentieth week; Wassermann reaction negative; N.P.N. 27 per cent; W.G.O. failed. No cause discerned for the abortion-stillbirth sequence.

Her aunt (Case No. 111) had had 1 set of stillborn triplets, 3 stillbirths, and 4 abortions.

CHRONIC MATERNAL DISEASES.

1. *Recurrent Toxaemia, Accidental Haemorrhage and Chronic Nephritis.*

In 115 of the cases of sequential abortion under consideration there was evidence of recurrent toxaemia or nephritis in 20 instances, a percentage of roughly 17.4. The following are two typical cases.

CASE NO. 92. Thirty-six years of age; married 17 years. First pregnancy: full-time stillbirth, following toxaemia of pregnancy. Second pregnancy: living child; normal pregnancy. Third pregnancy: abortion. Fourth pregnancy: abortion. Fifth pregnancy: premature stillbirth. Sixth pregnancy: abortion. Seventh pregnancy: abortion. Eighth pregnancy: abortion. Ninth pregnancy: abortion; albuminuria at the thirteenth week. Tenth pregnancy: premature stillbirth at the seventh month; nephritic toxaemia; blood-pressure 190.

CASE NO. 109. First, second, third, and fourth pregnancies ended in abortion at from the third to the sixth month. Fifth pregnancy: therapeutic abortion with albuminuric retinitis. She died of a stroke one year later.

The importance of recurrent toxaemia and nephritis in the aetiology of abortion sequences can be illustrated by almost any published series of cases dealing with the treatment of abortion sequences. Watson and Tew,[3] for instance, state that the development of toxaemia may be responsible for a failure under vitamin E therapy. Young[4] has drawn attention to the possibility of toxaemia arising in cases of sequential abortion once the chain of abortions is broken, and ascribes the abortions in these cases to the incidence of the specific pregnancy toxaemia very early in pregnancy. It is, of course, one of the most important questions in obstetrics whether recurrent toxaemia is to be regarded as due to a specific pregnancy toxin or whether it is the unmasking of a permanent renal lesion under the strain a pregnancy imposes on the maternal metabolism.

There is no doubt that in many cases the recurrent toxaemia is not due to a specific pregnancy toxin. This may be illustrated by the following two cases:—

CASE No. 85. This patient had had 5 consecutive abortions and stillbirths, each pregnancy terminating in an acute albuminuria, followed rapidly by intra-uterine death of the foetus. Her eldest sister (Case No. 124) gave the following history:

First pregnancy: premature living child, 3 pounds at birth. Second pregnancy: premature birth; infant died. Third pregnancy: stillbirth; severe albuminuria. Fourth pregnancy: abortion. Fifth pregnancy: stillbirth; albuminuria; N.P.N., 42 milligrams per cent, 2 months after delivery.

Her youngest sister had albuminuria in her first and only pregnancy, a living male child weighing 3 pounds being born at the thirty-sixth week. The fourth sister has three healthy children.

The second case was that of a patient (Case No. 73), whose first pregnancy ended in abortion at the fifth month; the second ended in a fatal toxaemia, at the time considered to be a specific pregnancy toxaemia. Inquiry into her family history showed that one of her sisters had had 5 children, 2 of whom were premature and stillborn, and she herself died suddenly of accidental haemorrhage in her sixth labour. Another unmarried sister died suddenly of a stroke at the age of 28. The fourth sister is unmarried and is confined to bed with Bright's disease at the age of 24.

The usual course of these cases of recurrent toxaemia is for one or more of the early pregnancies to end in abortion, the second or third pregnancy to progress further and be accompanied by toxaemia, and then if successive pregnancies are persisted in there is a progressive shortening of the duration of each pregnancy, with progressive deterioration in general health and

the appearance of signs of cardiorenal damage, even in the non-pregnant state. It is, of course, impossible to say with certainty in every case that the toxaemia will certainly recur in every pregnancy. Every now and then a woman will have a normal pregnancy intercalated in an abortion-stillbirth sequence due to recurrent toxaemia. Often such a successful pregnancy is due to a transient improvement in the patient's health, or due to extra care and rest mitigating the strain on her metabolism. The fact that recurrent toxaemia and nephritis may miss one or two pregnancies in a series must always be remembered when the question of the chances of recurrence of toxaemia is under consideration.

Of themselves, recurrent abortions and stillbirths do not lead to any permanent renal damage. A woman may have a long sequence of abortions without showing evidence of toxaemia in any pregnancy, and remain in good health at the end of the sequence. If such a woman continues to term in any pregnancy as a result of treatment or by chance, then she will not exhibit any evidence of pregnancy toxaemia. An abortion itself does not cause toxaemia and the evidence points on the whole to the conclusion that a permanent renal lesion is responsible for many, though by no means all, of the cases of sequential abortion.

2. *Systemic Diseases.*

In 4 of the abortion sequences some grave maternal disease was present. One patient was a diabetic. A second had exophthalmic goitre and had 5 successive abortions, 2 of which occurred after a partial thyroidectomy had relieved most of her general symptoms. A third patient had congenital aortic stenosis, with a patent interventricular septum. She had 4 successive abortions. The fourth patient had a double aortic valvular lesion due to rheumatism; she had 3 successive abortions. Aortic lesions are rare in pregnant women compared with mitral lesions, and it is interesting to note that no case of recurrent abortions occurred among the large number of women with mitral lesions admitted to the Maternity Hospital. The disturbance of the capillary pressure, which occurs in aortic lesions, suggests itself as a possible cause of the abortions in these aortic cases.

Syphilis.

The Wasserman reaction was taken in every case of sequential abortion and proved positive in 5 instances out of the 115 cases,

a percentage of 4. These 5 women had between them 5 abortions, 10 stillbirths and 1 living child.

Poor General Health.

In 8 of the abortion sequences the mothers were in very poor general health, manifested by anaemia, debility and fatigue, loss of weight, inability in one or two instances to nurse their living babies, because of absence of milk. Most of these women were in poor social circumstances. These 8 patients between them had 15 abortions, 12 stillbirths and 11 live children, 6 of these living children being born after the adoption of general restorative measures during the pregnancy, i.e., the provision of rest and extra nourishment and the administration of iron, but without the adoption of any therapy specifically designed for the prevention of abortion.

Obstetric Trauma.

In 9 of the series there was a history of a difficult delivery by the forceps in the first labour, followed by a period of ill-health and then a sequence of abortions and stillbirths. In 5 of these cases an ultimate living child was born without any special treatment.

The Therapy of Sequential Abortion.

The present inquiry has been more concerned with the aetiology of abortion sequences, rather than with their treatment. In the analysis of the cases it was possible to find a cause in 66 of the total 115 cases, approximately 58 per cent. In the remaining 42 per cent a cause could not be discerned.

It is possible that the clue to these cases of unknown origin may be found in the results of various supposedly specific therapies and, in fact, most of the work done in this subject has been concerned with the result of therapies built up on various *a priori* assumptions. Inasmuch as most of the cases in this series received some form or other of treatment, whether rational or not, a description of the results obtained may be of interest.

It is most important to bear the statistical aspects of the problem in mind when the results of any form of treatment are under consideration. It was shown, for instance, in Table I that the spontaneous cure-rate for a 2-abortion sequence is over 60 per cent., i.e., the likelihood of a third pregnancy continuing to term, is much greater than evens. Conversely the fact that

abortion sequences are due to a diversity of causes, including the random accidental causes, makes it impossible for any form of treatment to give complete success in every case. The incidence of casual abortion is about 17 per cent of all pregnancies, so that any truly specific therapy is likely to have about 17 per cent of failures, 83 per cent of successes, even if there were only one recurrent cause responsible for the sequence.

The various treatments which were adopted in the series were as follows:—

General Measures Alone.

In 25 of the cases no treatment was adopted other than supervision of the general health, combined with rest and the avoidance of trauma. There were 9 living children born, i.e., the observed spontaneous cure-rate was 36 per cent for women with 3 or more abortions, a figure corresponding roughly with the expected spontaneous cure-rate of 27 per cent.

Vitamin Therapy.

Nine women in the series received vitamin E therapy. The details of these cases were as follows:

Case No. 5. Twenty-nine years of age. First pregnancy: abortion. Second pregnancy: abortion. Third pregnancy: W.G.O. from the ninth week; continuance to term; living child.

Case No. 45. Twenty-seven years of age. First pregnancy: macerated stillbirth at term. Second pregnancy: abortion at the tenth week. Third pregnancy: abortion at the tenth week. Fourth pregnancy: W.G.O. from the tenth week; continuance to term; living child.

Case No. 48. Thirty-three years of age. First pregnancy: living child, now 10 years of age. Second pregnancy: abortion at the eleventh week. Third pregnancy: abortion at the fourteenth week. Fourth pregnancy: W.G.O. from the eleventh week; abortion at the twentieth week.

Case No. 94. First pregnancy: neonatal death. Second pregnancy: abortion at the fourth month; W.G.O. given from the twelfth week on account of slight spotting.

Case No. 120. Thirty-one years of age. Six abortions. Seventh pregnancy: W.G.O. from the ninth week; abortion at the fourteenth week.

Case No. 121. Twenty-one years of age. First pregnancy: abortion at the twelfth week. Second pregnancy: abortion at the eighth week. Third pregnancy: W.G.O. from the seventh week; Zondek-Aschheim test + at the twentieth week; expulsion of a grossly macerated foetus at the twenty-third week.

Case No. 127. First pregnancy: abortion. Second pregnancy: living

child. Third pregnancy: W.G.O. started 2 weeks after a slight bleeding, commencing at the ninth week; abortion 2 weeks later.

CASE NO. 128. Thirty-nine years of age. First pregnancy: abortion at the fifth month. Second pregnancy: premature child at the seventh month; died. Third pregnancy: abortion at the third month. Fourth pregnancy: abortion at the tenth week. Fifth pregnancy: W.G.O. from the eighth week combined with prolution; delivery of a living child.

CASE 129. Twenty-four years of age. Nine successive abortions; W.G.O. failed in the eighth and ninth though instituted after the first missed period.

Excluding the 2 cases in which treatment was instituted after bleeding had commenced, we see that the treatment was successful in only 2 cases of the remaining 7, a result no better than would have been obtained with general measures only.

In Watson's and Tew's[3] series there were 17 patients who had had 2 or more successive abortions. There were 5 failures, giving a cure-rate of about 70 per cent. Table I shows the spontaneous cure-rate for this group to be over 62 per cent.

The series of papers published by Shute[6, 7] shows that the administration of wheat germ oil is successful in these cases because it lowers the resistance of the blood-serum to trypsin digestion. He claims that in aborting women the resistance is raised. The validity of Shute's hypothesis stands or falls by the value of his test for the resistance to proteolysis of the blood-serum, and as regards actual clinical data his paper on accidental haemorrhage is very inconclusive. It would appear that while the experimental evidence for the role of vitamin E in the maintenance of pregnancy is impressive, the clinical results are far more convincing.

Vitamin E is not the only vitamin responsible for intra-uterine development. Mouriquand[8] and his co-workers have demonstrated the importance of ascorbic acid in maintaining the viability of guinea-pig embryo. The craving of most pregnant women during the early months for fresh fruit and vegetables may be the expression of the need for this vitamin.

Hormone Therapy.

Many papers dealing with the value of progestin therapy have been published.[9, 10, 11, 12] Young describes a total of 22 cases of recurrent abortion and stillbirth which he treated with proluton. In his 22 cases, however, there were only 5 fraternities containing 3 or more successive abortions and without any earlier living

child. Treatment was successful in 4 of these cases. His data are satisfactory inasmuch as treatment was instituted prior to the period at which the previous abortions had occurred. It is difficult, however, to assess his results because he does not make any distinction between toxaemic and non-toxaemic cases. Krohn, Falls and Lackner[10] report a series of 19 cases treated with progestin, with 14 successes. Only 4 of the successful cases had had 3 or more abortions. The details of these 4 cases may be criticized.

In the first case backache was the only complaint when the treatment was started at the fifth month of pregnancy, though the previous abortions had occurred between the third and fourth months. The second patient had spotted, had cramps, and was 5 months pregnant when first treated. The third success was a 4-abortion sequence which had a successful issue. The fourth success was 4 months pregnant when she was first seen, though her previous pregnancies had terminated at 3 months. If we exclude from the series cases of twinning and those patients with only 1 previous abortion, we are left with 9 cases who had had two or more abortions. Of these 9 patients 6 carried to term, a successful percentage of 66, as compared with the spontaneous cure-rate of 62 per cent. In 3 of the successful cases treatment was instituted after the period of pregnancy at which the previous abortions had occurred.

In the present series there were 4 patients treated with progestin therapy (Nos. 128, 129, 130, 131). The treatment was successful in 2 cases, 1 a 3-abortion-3-stillbirth sequence, the other a 3-abortion-1-stillbirth sequence. Evidence of toxaemia was not noted in the successful pregnancies. The treatment failed in 2 cases, in 1 of which, however, it was initiated after the onset of bleeding; in the other treatment was started after an initial haemorrhage had ceased spontaneously. Bleeding recurred 10 days after the inception of treatment and ended in abortion.

Progestin therapy certainly represents probably the most effective way we possess of treating some cases of threatened abortion. It is certain that more clinical data are needed before its exact scope can be determined.

Chemotherapy.

Arsenic. The clinical material of this paper was first collected over a period of about 4 years in an attempt to assess the value of the empirical injection of various organic arsenical compounds

in cases of habitual abortion, in which syphilis could be excluded. The method has been used in many of the North of England clinics for some years.

Thirty-three patients were treated with injections of organic arsenical compounds, usually novarsenobillon. The Wassermann reaction was negative in every case. Each patient had had two or more abortions or stillbirths.

Twenty of the patients gave birth to living children, 13 had further abortions or stillbirths. Arsenic therapy gave a percentage of successes of 61.

Of the 20 successful cases no cause could be found for the previous abortion-stillbirth sequence in 13 instances, in 3 of the cases there was a history of twinning, in 1 case hydrocephalus had previously occurred in the fraternity. It is evident from these figures that the successful results were obtained in patients in whom no cause could be found for the previous abortions. There was not a successful case in which there was a history of recurrent toxaemia or accidental haemorrhage.

Of the 13 failures 4 patients had chronic nephritis, 3 had had accidental haemorrhage in previous pregnancies, 1 patient had had 10 abortions and stillbirths, extreme obesity was a possible cause in 1 case, no cause could be discerned in 4 cases. As compared with the cases in which arsenic therapy was successful these failed cases contained a higher proportion of organic lesions, mainly renal.

Of a total of 22 cases of abortion sequence in which no cause would be discerned for the sequence, 18 cases were successfully treated by arsenic.

Arsenic therapy is of little avail in cases of recurrent toxaemia. Its action is difficult to explain and it is possible that nothing more specific than its general haematinic effect was responsible.

Perhaps the oldest method of treating recurrent abortion was by the exhibition of iron. For many years perchloride of iron was a favourite drug. In antenatal practice cases of tender uterus and occasional spotting occurring in women in poor social circumstances, are very common and the administration of iron is the standard and usually successful method of treatment. There is, of course, a good deal of experimental evidence dealing with the relation between vitamin E and iron assimilation. Simmonds,[13] in a very suggestive paper, concluded that deaths of rat embryos are due to a crisis in their iron assimilation, which can be obviated by providing vitamin E. He regards the liver fats as an important factor in the linked metabolism of iron and

vitamin E. Aspects of this linkage have been studied by Waddell and Sleenbrock,[14] who have demonstrated an antagonism between the two.

Manganese.

This metal plays a part in normal gestation. Everson and Daniels[15] have shown that the litters of does, fed on diets deficient in manganese, exhibit a high mortality. Bodansky[16] concluded that there is much to suggest that this metal is essential for normal reproduction both in plants and animals. Klein and Zieze[17] have shown that manganese acts as an activator for arginase, an interesting observation in veiw of the high arginine content of the early placenta.

As yet results such as these are only of academic interest to the clinician, but if, as seems likely to be the case, the causes of recurrent abortion are protean, further endeavours must be made to assimilate all the available data furnished by chemical embryology into our therapy. So long as "the early life of all men is hidden," as Newman said in a somewhat different context, the aetiology of some cases of abortion must remain obscure.

General Conclusions.

Abortion sequences have a varied aetiology. In any population the total number of instances of sequential abortion and stillbirth is made up of two groups of patients. The first comprises those cases in which successive pregnancies fail because of the chance succession of random and casual factors.

From a statistical standpoint, the presence of a recurrent factor may be inferred with reasonable certainty after the occurrence of three successive abortions, so that a 3-abortion sequence is almost certainly due to a recurrent factor. The total number of pregnant women in whom such recurrent factors occur is about 1 per cent, as opposed to about 17 per cent of pregnant women who abort from random and accidental causes.

A cause can be discerned in about one-half of the segregated recurrent aborters. These causes fall into the following three groups:—

(1) Early lesions of the developing embryo, probably resulting from a defective nutrition of the early chorion producing lesions at the successive critical phases of development.[2] In some of these cases familial causes may be demonstrated and the problem is closely linked with that of the recurrent factors which have been demonstrated by the geneticists as occurring in lower animals.

(2) Poor condition of the mother, chronic diseases, obstetric trauma.

(3) Evidence of chronic nephritis and the occurrence of pregnancy toxaemia and accidental haemorrhage. Evidence is presented which shows that the onset of late toxaemia in cases of recurrent abortion in which treatment has been successful is not the unmasking of a new lesion, but a manifestation of the same renal lesion which led to the former abortions. All cases of pregnancy toxaemia cannot be ascribed solely to a specific pregnancy toxin.

About one-half of the habitual aborters do not show any abnormality beyond occasional evidences of endocrine or metabolic disturbance. The efficacy of vitamin E therapy in this group is open to criticism. At the moment progestin therapy represents the best method of treatment.

The process of normal development is essentially the continued readjustment of the environment to the changing needs of the foetus. Concerned in this continual adaptation are vitamins, hormones, minerals and probably the essential foodstuffs, including the special amino-acids such as lysine and arginine, an aspect of the problem which has not yet received much study.

Embryos die for two reasons, either from maldevelopment or from interference with their early nutrition, and to advance our knowledge, further knowledge is necessary of the normal metabolism of the early human embryo.

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The Interpretation of Radiological Pelvimetry

BY

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PELVIMETRY by X-rays is now a well recognized diagnostic procedure; it is being increasingly used, and the literature on the subject is very extensive. There is not yet, however, any general agreement as to the interpretation of measurements of the pelvis so obtained in assessing the chances of labour, or even whether they are of any real value for that purpose. They have, indeed, been used to provide evidence in support of a theory of the perfect pelvis, and they have been used as the basis of some classifications of the pelvis which are of doubtful value in obstetrics, but there is an almost complete lack of statistical evidence showing the relation, which presumably exists, between the form of the pelvis and the difficulties of childbirth. At the same time the elucidation of this relation is precisely the type of problem which statistical methods are designed to solve, and this paper is a review using recognized statistical methods of the measurements in 350 cases made at Moreton District Hospital, and the labours in these cases. This number is amply sufficient to permit of sound generalizations on the form of the pelvis, although it is too limited to allow more than a statement of the position with regard to the associated labours.

THE TECHNIQUE OF MEASUREMENT.

Such a review is, of course, dependent on reasonably accurate measurements, and also, to some extent, on measurements carried to as fine a degree as is permitted by the technique employed. Some "error of observation", as it is called, is bound to be present even in measurements made on the skeleton itself, and it is inevitably greater in measurements made from radiographs. It arises in various ways. There is the possibility of an uncontrolled error inherent in the technique of measurement used; of this nature is the error due to the use of surface anatomy in the technique of Thoms, Roberts, and others; the plane of the brim is as variable as other anatomical features, and it is no more than a useful approximation to say that it passes through the

spine of the fourth lumbar vertebra. It is possible to estimate the error due to the use of the approximation mathematically, and it may amount to half a centimetre or more, so that measurements by these techniques can be expressed only to the nearest half centimetre; Thoms[1] is conscious of this source of error and uses a lateral view of the pelvis to correct it. The technique in use at Moreton District Hospital (Nicholson)[2] is a stereometric method, and is thus entirely independent of surface anatomy; measurements made by it may justly be given to the nearest millimetre, a degree of fineness that is very useful in statistical work. Other sources of error lie in occasional difficulties in recognizing anatomical points in radiographs, and in the use of the tools of mensuration including arithmetical calculations; no technique can ever quite suppress these errors, and their effect can only be discounted by having each pelvimetry done separately by two independent workers and the results correlated.

The Material.

The 350 cases consist almost entirely of primigravidae who have, during the past 5 years, presented themselves for admission to the maternity ward of the hospital. They include a few multiparae who have been measured for various reasons, and a very few cases who have been referred from other districts. They are derived from all strata of society, and there is no reason to think that they do not furnish a fair sample of the women of child-bearing age in Gloucestershire and probably in rural England.

The Form of the Pelvis.

The adult form of the pelvis is, like other anatomical features, the resultant of a great many factors which vary in intensity from individual to individual, and it is the variation of these factors which produces the diversity in form of the pelvis. If we group these factors we should consider first in point of time the group of factors connected with heredity; Turner pointed out that the white and yellow races are predominantly platypellic, the negroid races mesatipellic, and the more primitive races dolichopellic; these factors are then of very great importance, and it is not impossible that a review of the form of the pelvis in families might be useful in the study of heredity. Next in time come the factors which may be grouped as genetic, this term including the sex factor, for the sex characters of the pelvis are fixed as

early as the third or fourth month of foetal life; then come the growth factors including intra-uterine nutrition and the influence of the pituitary hormone. After birth there are the nutritional factors including the deficiency diseases, the functional factors including the assumption of the erect posture, the factors of infectious and other diseases of childhood, and last of all in point of time, and probably of importance, the factors due to the sex hormones. It is virtually impossible to assign a definite value to any of these factors; and to concentrate attention on any one factor and to deduce a relation between that factor, the form of the pelvis, and the difficulties of labour is not a scientific approach to the problem.

The frequency distribution of any measurement which is the resultant of many factors is bound to fall into a fixed pattern; to quote Udny Yule,[3] "If a variable is the sum (or, within limits, some slightly more complicated function) of a *large number* of other variables, then the distribution of the compound or resultant variable is normal, provided that the elementary variables are independent, or nearly so." This is certainly true of measurements of the general stature, of the skull, and of the long bones, and there is no ground for doubting that it is equally applicable to measurements of the pelvis. If one factor has a much greater force than the others we might expect that the normal curve would not be a good fit, but would be distorted in some direction. The method of approach to our problem is, then, to fit a normal curve to the principal measurements at the brim, to test how far they agree with the curve, and to go on to deduce the nature of the distribution of the shape and size of the opening at the brim.

The Conjugate and the Transverse Diameters.

Figures 1 and 2 show the frequency distribution of these two diameters; in each case the diameters are grouped at intervals of 3 mm., and the height of the corresponding column gives the number of cases with a diameter within those limits. The mean and the standard deviation are calculated from these observed figures, and the curve can then be plotted and the expected numbers calculated. The test of fit is arrived at by comparing the observed and the expected numbers, and the result is expressed by the value of P whose maximal value is 1; this value indicates the probability of arriving at as bad a distribution by chance. Thus in the case of the conjugate, in spite of the break above the value of 100 mm., the fit is fairly close; with a value for P of 0.68 we might expect as bad a distribution or

worse 68 times out of 100 in groups of 350 cases. This being so, it is not possible to assign any very definite significance to the break at 100 mm. It may very well have happened in this way by pure chance, although, bearing in mind the very even distribution of the transverse diameter, it is not unlikely that some factor has been of sufficient strength to affect the length of the conjugate in a fairly large proportion of the cases; and it must not be forgotten that the majority of these patients were young children or infants at the period of underfeeding due to the war of 1914–1918.

In the case of the transverse diameter the curve is a very good fit indeed, and only once or rather less in 10 times could we expect a better. It might be as well here to indicate the effect of the error of observation which was mentioned above. On the mean it can have practically no effect; its effect on the standard deviation is to increase its value to an extent which depends on the amount of the error, but the error must be very gross indeed before this effect is very appreciable; it will also tend to smooth out irregularities in the distribution and so improve the fit to the curve. It should also be noted that it is of no great moment for our purpose whether the normal or some other curve gives the best fit to our observed figures; the curve is only of value as showing graphically that the mean and the standard deviation, the constants which are required for further deductions, are accurate within reasonable limits. That having been demonstrated, we can proceed with some confidence.

The next question that we have to determine is whether and how far these diameters are related to each other, whether the transverse increases, or possibly diminishes, as the conjugate increases, or, to put it in statistical language, we wish to determine the correlation coefficient. This is done in the correlation table, Table I.

The value of the correlation coefficient has a maximum of 1, and a value as low as 0.0434 is not greater than might occur by chance if there were not any relation between the diameters, so that it is probably of no significance and the diameters may be taken to vary in length quite independently of each other.

This result is a little surprising for we are accustomed to speak of the justo-minor and the justo-major pelves as reasonably common, but against this we must set the tendency of the pelvis to be either flat or narrow; and, as we have seen, the one tendency counterbalances the other.

TABLE I.

Correlation between transverse and conjugate diameters.

Conjugate diameter: Limits of groups	Transverse diameter: 115.5	120.5	125.5	130.5	135.5	140.5	145.5	150.5	155.5	Totals
89.5	—	—	—	1	1	1	—	1	—	—	4
95.5	1	1	—	1	1	2	2	—	—	—	8
101.5	—	1	1	6	6	4	4	1	—	—	23
107.5	—	1	2	8	6	7	1	—	—	—	25
113.5	1	6	9	15	25	6	6	1	—	1	70
119.5	2	3	9	21	23	15	8	2	—	1	84
125.5	—	6	10	17	24	8	5	1	—	—	71
131.5	—	1	3	6	10	13	4	1	1	—	39
137.5	—	1	2	3	5	5	1	—	2	—	19
Totals	—	—	—	—	1	4	2	—	—	—	7
	4	20	36	78	102	65	33	7	3	2	350

Correlation coefficient, 0.043; Standard error, 0.053.

THE SHAPE OF THE PELVIC BRIM.

Although other criteria have been suggested from time to time for classifying the pelvis according to its shape, nothing has ever definitely displaced the pelvic index used by the anthropologists following Turner. The pelvic index is the percentage ratio of the conjugate to the transverse; it is thus low in the flat pelvis, high in the narrow pelvis, and has a value of about 100 in the round pelvis. The frequency distribution of the pelvic index will again be a normal curve, and from the results already obtained it is possible to calculate its mean and standard deviation. Figure 3 gives this curve with the calculated frequencies for different values of the index, and on this curve have been superimposed the observed frequencies in our series. It will be seen that the fit is very good, but as the errors of observation have now been added together any irregularities in the distribution have been still further smoothed out. At the same time this fit gives an encouraging proof of the accuracy of the figures from which it was deduced.

From this curve it is, of course, possible to predict the percentage of pelves of any particular shape that we may expect in a sample. Thus it is seen that well over 50 per cent of all women have pelves of a distinctly flattened type, and if we consider as round those pelves with an index of between 95 and 100 the number of round pelves is no more than 12 to 13 per cent of the whole. With the shape of the brim distributed in a regular curve like this, it seems safe to assume that labour would be easiest for those cases with measurements near the mean and that difficulties would become increasingly frequent as the tails of the distribution were approached. That being so it might be as well to retain for our purposes the old and simple classification of the pelvis into the flat, the narrow, and the average pelvis, thus describing the tails and the middle of the distribution. For this rough classification it does not seem necessary to lay down any strict criteria. Moreover, as the foetal head always engages in the transverse diameter of the maternal pelvis, it is difficult to see how the shape of the pelvis, except possibly in extreme cases, can have much, if any, effect on labour, and on those grounds again classification is unnecessary if not misleading.

The Size of the Pelvis at the Brim.

If it is difficult in theory to assign any significance to the shape of the brim in obstetrics, it is equally easy in theory to see that its size may be of very great importance, and by size we obviously mean the area of the opening. The area of an opening is usually described in one of two ways, it is described by its diameter (or radius), or by its area in square measure. As this particular opening is irregular in outline, there is no real mean diameter, but it would be quite reasonable to describe it by the mean of the two main diameters; for this purpose the mean used would be the geometric and not the arithmetic, i.e., the square root of the product of the two diameters. On the whole it seemed sounder to find some approximation to the area in square measure, and it was found that, if the opening of the brim was considered as an ellipse on the two main diameters as major and minor axis, the area so calculated was a close enough approximation to the real area for the practical purpose of obstetrics. Figure 4 shows the average amount of error in this approximation; the outlines of four pelves are given to which are applied ellipses described on the conjugate with the transverse diameter as

the other axis; the overlap is ruled at intervals of half a centimetre; if the squares are counted the two areas can be compared. In these four samples, taken more or less at random from the series to show different shapes of pelvis, the calculated area does not differ from the actual area by more than 5 square centimetres.

The frequency distribution of this approximate area is once more a normal curve whose constants may be calculated from the figures for the diameters. Figure 5 gives this curve with the observed figures superimposed as in the case of the index. The upper tail of this distribution will be occupied by the justo-major pelves which are not likely to be associated with the difficulties of labour, and it is the other tail with which we are likely to be concerned. It should be noted that, in all but the smallest pelves, the area exceeds by a substantial margin the area of a section of the flexed foetal head through the biparietal diameter. This section is roughly circular and in the average foetal head will have an area of about 70 square centimetres, while from the curve it can be calculated that we only need expect 3 cases in 1,000 to have an area less than 90 square centimetres. We are too apt to accept as accurate illustrations showing an unflexed foetal head occupying almost the whole available area of the pelvis. Fig. 6 is a tracing from a radiograph taken at the onset of labour, showing the flexed foetal head entering the pelvic cavity with its sagittal plane in the transverse diameter of the pelvis.

One other point remains to be determined with regard to measurements at the brim; is there any correlation between size and shape? From the figures for the two diameters it is possible to deduce a considerable amount of correlation with a positive coefficient as high as 0.426; and a correlation table compiled from our 350 cases gives a value of 0.432. Figure 7 is a scatter diagram showing the distribution of the cases according to pelvic index and approximate area. The line *RR'* is the line of regression of the area on the index; it should indicate the average area we might expect for any given index. In this case the line does not seem to accord well with the distribution, and it is possible that the relation between these two functions is somewhat complex. Whatever form it takes, there is this definite relation, and it must be borne in mind when assessing the importance of either of these functions in impeding labour, for difficulties due to one of them may easily be wrongly attributed to the other.

The Outlet of the Pelvis.

There is still some confusion as to what should properly be described as the outlet of the pelvis, and as to how it should be measured; but both theory and practice suggest that it would be well to divide the outlet, for obstetric purposes, into two distinct levels. There is first that plane which is the last plane completely outlined by the bony pelvis and through which the foetal head must pass still fully flexed; this plane has the anatomical name of "the plane of least pelvic diameter", which name is itself suggestive. Below this comes the pubic arch in the centre of which lies the orifice of the undilated vagina and through which the foetal head extends to be delivered. It seems to be a definite mistake to treat these together as the outlet, because, as will be seen, contraction at one is not necessarily associated with contraction at the other, and because the obstetric problems presented by them are of a different nature.

The Plane of Least Pelvic Diameter.

This plane passes through the lower edge of the symphysis pubis, the ischial spines, and the sacro-coccygeal joint; below its level there is left the lower part of the ischia and the pubic arch in front, and behind only the coccyx, which is, for obstetric purposes, treated as belonging to the soft parts rather than to the skeleton. This plane is also roughly the line of origin and attachment of the levator ani muscle. Disproportion at this level produces the difficulty in labour that is dealt with by mid forceps; a difficulty which is also produced by failure of the muscle to relax properly. Figure 8 is drawn from an actual section of a pelvis.

Mensuration of the Plane of Least Pelvic Diameter.

Measurements of this plane have been made in 250 cases; with regard to the antero-posterior diameter the error of observation, for technical reasons, is considerably greater than in measurements made at the brim. Nevertheless, there is still sufficient accuracy for our purposes. Its frequency distribution is given in Figure 9, and it should be noted that its standard deviation is just a little less than that of the conjugate diameter at the brim; but greater in the transverse measurements. In place of the true transverse diameter, which would be difficult to define in any radiograph, the diameter between the ischial spines has been

used. This measurement is somewhat less than the true transverse as is evident from Figure 8, and this must be borne in mind when we come to deal with the area of this opening. The frequency distribution of this diameter is given in Figure 10; its standard deviation is much the same as that of the transverse diameter at the brim.

Table II gives the correlation between these diameters, and although there is definitely a closer relation between them than in the case of the corresponding diameters at the brim, it is not of much significance.

TABLE II.

Correlation between antero-posterior and transverse diameters of the outlet.

Diameter between ischial spines	Pubo-sacral diameter											
Limits of groups	109.5	114.5	119.5	124.5	129.5	134.5	139.5	144.5	149.5	154.5	Totals
88.5	--	—	1	2	1	—	1	—	—	—	—	5
92.5	—	1	1	2	1	4	2	1	—	—	—	12
96.5	1	2	3	3	4	6	1	3	—	—	—	24
100.5	—	—	5	3	7	3	4	2	1	1	—	26
104.5	—	2	2	6	10	9	7	4	3	—	1	44
108.5	—	1	7	9	13	12	8	7	4	1	—	62
112.5	—	2	6	4	8	4	5	7	3	1	—	40
116.5	—	2	—	4	5	5	3	2	—	—	—	21
120.5	—	—	—	2	3	1	1	1	1	1	—	10
124.5	—	—	—	—	—	1	—	—	2	1	—	4
	—	—	—	1	—	1	—	—	—	—	—	2
Totals	1	10	25	36	52	47	32	27	14	5	1	250

Correlation coefficient, 0.163; Standard error, 0.062.

THE SIZE OF THE PLANE OF LEAST PELVIC DIAMETER.

As this, lower, opening of the pelvis cannot be quite as mechanically rigid as the brim, its shape cannot be of much significance in obstetrics. The outline is, however, a very close approach to an ellipse and its area calculated on that supposition must be very close to the real area; this area varies within as wide limits as does the area at the brim, and since the average

area is less by one-tenth than the average area at the brim, it seems extremely likely that some measure of disproportion is not very uncommon at this level. Figure 11 gives the frequency curve for this area calculated from the measurements of the diameters with the observed figures superimposed. The fact that the observed figures fit so well to the figures calculated from the curve is again a guarantee that the observations are reliable. Here, too, it is the lower tail of the distribution with which we are likely to be concerned, and here we can expect 18 cases out of 100 to have an area below 90 square centimetres.

The Pubic Arch.

The measurement which is customarily used for this part of the pelvis is the diameter between the ischial tuberosities, but that length varies both with the length of the lower rami of the pubes and ischia and with the size of the pubic angle. Moreover, the biparietal diameter of the foetal head, except in extreme cases, is not likely to exceed this diameter. Therefore, it tends to give a better indication of the size of the arch if we use the angle itself as the measurement. This subpubic angle is not exactly defined in anatomical textbooks and in the series it has been defined as the angle between two lines passing through the lower edge of the symphysis and through the lower rami of the ischia just before they expand into the tuberosities. Contraction of this angle will, theoretically, produce delay in extension of the head. Figure 12 shows how the foetal head extends normally through an average subpubic angle; as soon as the biparietal diameter has passed through the plane of least pelvic diameter the head can extend under the pubic arch on the axis of the upper cervical vertebrae; in this case the radius of the curve swept out by the head is the minimum. When the angle is contracted the forces of expulsion try to extend the head on the occiput as axis; this lengthens the radius of the circle through which the sinciput must sweep, and if there is a short antero-posterior diameter at this level extension may be impossible; in any case the perineum is liable to be severely damaged. Difficulty at this level is dealt with by low forceps, the foetal head being pulled down a further inch to permit it to extend normally through the wider part of the arch on the axis of the upper cervical vertebrae.

As before, the subpubic angle is distributed in a normal curve; Figure 13 shows this distribution round a mean of 84.8 degrees; the coefficient of variation is much the same as that of other pelvic measurements.

Correlation Between Brim and Outlet.

It seems to be generally held that it is possible to predict contraction of the outlet from the shape of the brim; any connexion of this kind should appear clearly from the coefficient of correlation between these four measurements of the pelvis which have been considered: (1) The pelvic index, (2) the area at the brim, (3) the area at the outlet, (4) the pubic angle. We have already seen that there is a considerable amount of correlation between the pelvic index and the area at the brim. Tables III and IV are correlation tables between the pelvic index and the

Table III.

Correlation between pelvic index and area of outlet.

		Pelvic index										
	Limits of groups	65.5	71.5	77.5	83.5	89.5	95.5	101.5	107.5	113.5		Totals
Area of outlet	82.5	—	—	1	—	2	1	—	1	—	—	5
	88.5	—	—	1	1	2	3	4	—	—	—	11
	94.5	—	1	—	1	5	4	4	3	—	—	18
	100.5	—	1	1	9	9	12	6	2	—	1	41
	106.5	1	4	1	9	11	16	3	—	1	—	46
	112.5	—	—	5	9	9	13	9	2	1	—	48
	118.5	—	3	—	5	14	9	3	1	—	—	35
	124.5	—	—	3	6	4	9	1	3	—	—	26
	130.5	—	—	1	1	5	3	2	—	—	—	12
	136.5	—	—	—	1	1	—	1	—	—	—	3
		—	1	—	—	3	—	—	1	—	—	5
	Totals	1	10	13	42	65	70	33	13	2	1	250

Correlation coefficient, −0.106; Standard error, 0.063.

outlet; the figure for the correlation coefficient is in each case less than twice the standard error, so that these values might have arisen by chance, and it is legitimate to conclude that the shape of the brim is unrelated to the size of the outlet and that in consequence it is quite impossible to predict contraction at the outlet merely from consideration of the shape of the brim.

TABLE IV.
Correlation between pelvic index and pubic angle.

Pubic angle: Limits of groups	Pelvic index: 65.5	71.5	77.5	83.5	89.5	95.5	101.5	107.5	113.5	Totals
66.5	—	—	—	1	1	—	—	—	—	2
70.5	—	—	1	—	1	1	1	—	—	4
74.5	1	—	1	3	5	3	2	2	—	17
78.5	—	—	—	2	4	3	5	4	—	18
82.5	—	—	4	7	13	18	9	2	—	53
86.5	—	4	1	8	11	18	7	—	1	50
90.5	—	2	4	9	18	13	4	2	1	54
94.5	—	1	2	8	8	10	2	—	—	31
98.5	—	1	—	3	2	3	1	2	—	12
102.5	—	2	—	1	1	1	2	1	—	8
Totals	—	—	—	—	1	—	—	—	—	1
	1	10	13	42	65	70	33	13	2	1	250

Correlation coefficient, −0.033; Standard error, 0.063.

There is, on the other hand, a considerable relation between the area at the brim and the area at the outlet. The correlation coefficient between these two functions calculated from our 250 cases is 0.446, and the distribution is shown in the scatter diagram, Figure 14. The line *RR'* is the line of regression of the area at the outlet on the area at the brim, and in this case accords so well with the distribution that we can be certain that the relation is linear. Table V is a correlation table between the area at the brim and the pubic angle; here the coefficient is so small as to have no significance. Similarly, Table VI shows the relation between the area at the outlet and the subpubic angle; the coefficient is 0.250, showing a considerable degree of accord between these functions, and it must no doubt be true that difficulty at the outlet is in many cases due to a combination of the two difficulties.

TABLE V.

Correlation between area of brim and pubic angle.

Pubic angle	Area of brim											
Limits of groups	90.5	97.5	104.5	111.5	118.5	125.5	132.5	139.5	146.5	153.5		Totals
66.5	1	1	—	—	—	—	—	—	—	—	—	2
70.5	—	—	1	—	2	—	—	1	—	—	—	4
74.5	1	—	2	1	7	3	2	1	—	—	—	17
78.5	—	—	2	1	6	1	3	2	1	1	1	18
82.5	—	1	2	3	12	13	9	6	4	3	—	53
86.5	—	—	5	9	10	11	8	4	3	—	—	50
90.5	—	1	4	10	8	15	9	3	2	2	—	54
94.5	—	—	1	7	7	5	4	4	2	1	—	31
98.5	—	1	1	1	2	2	3	2	—	—	—	12
102.5	—	1	4	—	1	2	—	—	—	—	—	8
	—	—	—	1	—	—	—	—	—	—	—	1
Totals	2	5	22	33	55	52	38	23	12	7	1	250

Correlation coefficient, −0.042; Standard error, 0.063.

TABLE VI.

Correlation between area of outlet and pubic angle.

Pubic angle	Area of outlet											
Limits of groups	82.5	88.5	94.5	100.5	106.5	112.5	118.5	124.5	130.5	136.5		Totals
66.5	1	1	—	—	—	—	—	—	—	—	—	2
70.5	—	2	—	2	—	—	—	—	—	—	—	4
74.5	2	1	2	3	6	2	—	1	—	—	—	17
78.5	—	1	4	2	6	3	1	1	—	—	—	18
82.5	1	4	2	8	11	12	6	6	2	1	—	53
86.5	—	—	3	10	6	11	10	6	2	1	1	50
90.5	—	1	5	6	8	12	9	5	6	—	2	54
94.5	—	—	1	8	4	7	5	4	1	—	1	31
98.5	1	—	1	—	5	1	1	2	—	—	1	12
102.5	—	1	—	2	—	—	3	1	—	1	—	8
	—	—	—	—	—	—	—	—	1	—	—	1
Totals	5	11	18	41	46	48	35	26	12	3	5	250

Correlation coefficient, 0.250; Standard error, 0.062.

The Pelvis as a Whole.

As the figures for all these measurements differ to some extent from the figures usually given in textbooks, it has been thought well to collect them together for comparison. The figures quoted are no doubt very old and have been copied from text-book to textbook without verification; they were probably originally made from small numbers of the pelves of aged cadavers, and there is no reason why they should be regarded as immutable.

	Gray's anatomy	Moreton-in-Marsh		
Brim	Mean	Mean	Standard deviation	Coefficient of variation
Conjugate diameter ...	110 mm.	116.4 mm.	10.5 mm.	9.0
Transverse diameter ...	135 mm.	132.3 mm.	7.6 mm.	5.8

Correlation between these diameters negligible.

	Gray's anatomy	Moreton-in-Marsh		
Outlet	Mean	Mean	Standard deviation	Coefficient of variation
Antero-posterior diameter	127 mm.	130.1 mm.	9.6 mm.	7.4
Transverse diameter ...	110 mm.	105.4 mm.	7.7 mm.	7.3

Coefficient of correlation between these diameters, +0.163.

In the same way the four functions of the pelvis which are suggested as of value for obstetrics are brought together; they present a complete survey of the average pelvis with the amount of variation that is to be expected.

Brim	Mean	Standard deviation	Coefficient of variation
Pelvic index	88.3	9.4	10.7
Approximate area ...	121.0 sq. cm.	12.9 sq. cm.	10.7

Outlet	Mean	Standard deviation	Coefficient of variation
Approximate area ...	106.7 sq. cm.	11.9 sq. cm.	11.2
Pubic angle	84.8 degrees	7.3 degrees	8.6

The extent to which these four functions vary with each other is given by the coefficients of correlation.

Functions.	Coefficient of correlation
Pelvic index / Area at brim	+ 0.432
Pelvic index / Area at outlet	Negligible
Pelvic index / Pubic angle	Negligible
Area at brim / Area at outlet	+ 0.446
Area at brim / Pubic angle	Negligible
Area at outlet / Pubic angle	+ 0.250

The Incidence of Rickets.

It was noted that the figures in the case of the conjugate diameter were suggestive of the influence of rickets, and if we examine the other frequency distributions this effect is still a little in evidence. In the case of the pelvic index and the area at the brim, since these figures are obtained directly from the diameters it is not surprising to find an unduly high proportion of cases at the lower end of the scale; in both of these functions, too, the expected curve is actually not a true normal curve but is very slightly skew with fewer cases at the lower end and more at the higher end, so that the effect is even more marked than is shown. It has long been recognized also that the flat rachitic pelvis tends to be associated with a pubic angle which is above the average, and if the correlation table (Table IV) between the pelvic index and the pubic angle is consulted it will be seen that, although there is not any relation throughout the rest of the table, in the first two columns, where the pelvic index is less than 71, the average pubic angle is over 90 degrees. This effect could hardly have been produced by chance (the odds against it are about 90 to 1), so that it is likely that here again there is some slight evidence of the incidence of rickets.

It should be strongly emphasized that these figures are com-

piled from a population that is entirely rural, and that they cannot be applied without great reservation to the populations of the cities and industrial areas of Great Britain, where the incidence of malnutrition and its effect on the skeleton is almost certainly very much higher. Nor can they be applied to a foreign country; a recent paper by Greulich and Thoms[4] shows that the average pelvic index in the Eastern States of America must be 95 or more compared with 88 in rural England, and it is a pity that Thoms, with this wealth of material, should have abandoned the pelvic index and made use of a classification that is hardly capable of mathematical treatment. At the same time the figures from Moreton-in-Marsh have this great virtue for statistical purposes, they have been obtained from a sample which is at once practically homogeneous and practically unselected within the population. Their contribution to the obstetrical problem is, on that very account, however, less than it might be, for the sample contains much less than the average proportion of the contracted pelves with which the obstetrician has to deal.

Pelvimetry and Labour.

For other reasons the statistical evidence with regard to labour cannot be as reliable as the evidence adduced with regard to pelvic measurement. In the first place the maternity department of the hospital has no more than 8 beds, and in a unit of this size it is not feasible to keep more than the simplest records. Again, as it is a general practitioner hospital (with the services of a consulting obstetrician), our judgment as to the need for interference with labour would not readily be accepted as evidence. Last of all, although measurement by radiography has been in use at the hospital for 5 years, the accumulation of material is slow; and while statistical results from small numbers may be suggestive, it is not possible to make them very conclusive.

The Material.

A preliminary enquiry was made through nearly 1,000 deliveries, to find the usual ratio in the hospital of assisted to unassisted deliveries; and this figure was got out separately for primiparae and multiparae. Assistance was roughly defined as any interference with normal delivery necessitating a general anaesthetic; it thus includes the delivery of breech presentations,

the complications of placenta praevia, surgical induction in toxaemia of pregnancy, and other conditions which are not in any way related to the enquiry we are making. There is no doubt, however, that the bulk of the assistance consists in the application of low forceps to complete, or merely to control, delivery over the perineum, and here again the relation of assistance to pelvic contraction is not necessarily very close, for all those cases are included in which the uterine contractions were not very powerful or were misused. At any rate, in the case of primiparae 44 per cent were assisted in labour and the remaining 56 per cent delivered themselves unaided; for multiparae the figures were 15 per cent assisted and 85 per cent unassisted. These figures are not put forward as indicating good obstetrics, they are equally not apologized for as being an indication of bad obstetrics; they are simply figures which are to be used for our special purpose. They do, however, show that labour is a very different problem in primiparae and multiparae, a fact which never seems to be sufficiently emphasized in textbooks on midwifery. As it is vitally necessary in statistical work to ensure that the material used is strictly homogeneous, it was necessary to restrict the enquiry in our case to primiparae and to use the same series for all the work. This limited the material to 250 cases, and these 250 cases are obviously practically identical with the 250 used for the statistical work on the measurements of the outlet.

The Statistical Method.

The method used is to arrange the cases in order of the particular measurement under consideration, to divide them into five groups as nearly equal as possible, each group ending at a definite value, to compute the percentage of assisted and unassisted labour in each group, and to compare these percentages with the percentage for the whole. The percentage of assistance for the whole 250 cases is 46, but it will be only infrequently that this exact figure will occur in groups of 50 cases taken at random from the series. Indeed, for groups of 50 the standard error of this percentage is 7 per cent, so that unless a group shows a percentage for assistance higher (or lower), than 46 per cent by 14 per cent, i.e. twice the standard error, we cannot be certain that this is not the effect of chance and cannot assert that there is any connexion between the measurement we are considering and difficulty in labour.

Measurements at the Brim and Labour.

Table VII gives the figures thus arranged for the pelvic index and the area at the brim. In the case of the pelvic index the

Table VII.

Correlation between measurements at the brim and interference with normal labour.

Pelvic index						
Limits of groups	82.5	86.5	90.5	95.5		Totals
Assisted	28 (50%)	21 (43%)	22 (50%)	20 (39%)	24 (48%)	115 (46%)
Unassisted	28 (50%)	28 (57%)	22 (50%)	31 (61%)	26 (52%)	135 (54%)
Totals	56	49	44	51	50	250

$\chi^2 = 2.05$. $n = 4$. $P = 0.73$.

Approximate area of brim						
Limits of groups	109.5	116.5	122.5	131.5		Totals
Assisted	26 (50%)	26 (50%)	22 (47%)	19 (40%)	22 (43%)	115 (46%)
Unassisted	26 (50%)	26 (50%)	25 (53%)	29 (60%)	29 (57%)	135 (54%)
Totals	52	52	47	48	51	250

$\chi^2 = 1.65$. $n = 4$. $P = 0.80$.

χ^2 test shows that such a distribution of our 250 cases would occur by chance about three times out of four, and the percentage of assistance does not vary from one end to the other, so that we can conclude with fair certainty that variation in the pelvic index is unassociated with difficulty in labour. A patient with a flat pelvis has quite as good a chance of an easy labour as one with a round, or a narrow, or any other shape of pelvis.

With regard to the area, although here again the χ^2 test gives a very similar result, our deduction is not so easy. In this case we recognize that it is only at the very end of the scale that we are likely to experience difficulty. We can only conclude with certainty that, in a rural population, contraction at the brim is a rare cause of difficulty, and that such contraction must reduce the area at the brim much below 109 square centimetres before it affects labour; the figures do not permit us to go further. It is never safe to found an argument on individual cases, but

there is in the series one patient with an area at the brim of 94 square centimetres who has delivered herself normally of a normal child, weighing 6 lb. 7 oz., and there are two cases with areas of 85 and 88 square centimetres respectively on whom it was judged necessary to deliver by Caesarean section. It seems then likely that the line below which normal delivery becomes a doubtful proposition should be drawn somewhere about an area of 90 square centimetres.

Measurements at the Outlet and Labour.

Table VIII is similarly arranged for the area at the outlet and for the pubic angle. In the case of the area it is at once seen that there is a very significant rise in the percentage of assistance in the lowest group, and the significance of this is

Table VIII.

Correlation between measurements at the outlet and interference with normal labour.

Approximate area of outlet						
Limits of groups	97.5	103.5	109.5	118.5		Totals
Assisted	31 (64%)	22 (47%)	27 (51%)	14 (27%)	21 (43%)	115 (46%)
Unassisted	19 (36%)	25 (53%)	26 (49%)	37 (63%)	28 (57%)	135 (54%)
Totals	50	47	53	51	49	250

$\chi^2 = 12.96$. $n = 4$. $P = 0.01$.

Subpubic angle						
Limits of groups	79.5	82.5	86.5	90.5		Totals
Assisted	35 (69%)	24 (51%)	19 (41%)	17 (33%)	20 (36%)	115 (46%)
Unassisted	16 (31%)	23 (49%)	27 (59%)	34 (67%)	35 (64%)	135 (54%)
Totals	51	47	46	51	55	250

$\chi^2 = 16.76$. $n = 4$. $P = 0.002$.

emphasized by the χ^2 test which shows that such a distribution could only occur by chance once in 100 such samples of 250 cases. There is then an obvious association between contraction at this level and difficulty in labour. From our figures we can

conclude that the line between the chances of normal and difficult labour occurs somewhere about 90 square centimetres. Of course, contraction here, unless it be extreme, cannot result in disaster in the same way as it does at the brim, for delivery with the forceps should be possible, even if difficult.

The association between narrowing of the pubic angle and difficulty in labour is also very obvious from the table. The lowest group shows a marked rise in the percentage of assistance, and the odds against such a chance arrangement are very large. Here the line where normal delivery becomes doubtful should probably be drawn somewhere in the region of an angle of 75 degrees, and here again a timely episiotomy and the application of low forceps offer an easy solution.

We can now definitely state our conclusion that the great majority of the minor difficulties of labour, so far as these are due to contraction of the pelvis, are due to a contraction at the outlet, which is quite unassociated with any contraction or any alteration of shape of the brim.

The numbers are obviously not enough to investigate the relation, if it exists, between pelvic contraction and malpresentation. Nor has mention been made of measurement of the foetal head. The foetal head does not appear to be very variable in size; recent figures giving a mean and standard deviation for measurements of the head do not seem to be available, but it is very doubtful whether the coefficient of variation for the foetal skull is large enough, in comparison with that of the maternal pelvis to justify accurate measurement of it at, or near, term. In addition the foetal head can be moulded to a surprising extent and its cross section reduced sufficiently to bring it within normal limits if it is large.

Conclusion.

As is the case with most new methods, radiological pelvimetry has suffered more in reputation from the enthusiasm of its followers than from the criticism of its detractors. Nobody is so foolish as to claim that the radiologist is to supersede the obstetrician in the judgment as to when a Caesarean operation is necessary; but nobody should be so foolish as to claim that the obstetrician can afford to neglect precise information about the bony pelvis with which he has to deal. It is probably true that radiological pelvimetry is of least value to the most highly skilled obstetrician, and it is equally true that nobody but the most highly

skilled obstetrician can assess the true value of radiological pelvimetry. Until any new diagnostic method or any new line of treatment has submitted itself to the rigid test of figures it cannot properly take its place in scientific medicine, and the statistician, however much he is disliked, must have his place in obstetrics as in other branches of medicine. This question of the value of radiological pelvimetry is a question that is peculiarly suited to his methods. A carefully planned experiment, well carried out, could in less than a year assess the true value of the method, and lay down the criteria in figures on which possible disproportion should be diagnosed. This paper will not have failed in its purpose if it has even suggested lines on which such an inquiry might proceed.

SUMMARY.

Measurements of the pelvis in 350 cases, obtained by radiography, are examined by biometric methods, and the means of the different diameters are laid down.

A method of computing an approximation to the area of the pelvic opening is discussed.

The importance of the plane of least pelvic diameter, and of the subpubic angle in obstetrics are discussed.

Statistics of labour in 250 cases are compared with the pelvic measurements in those cases, and it is shown that minor difficulties in labour are associated with contraction at the outlet.

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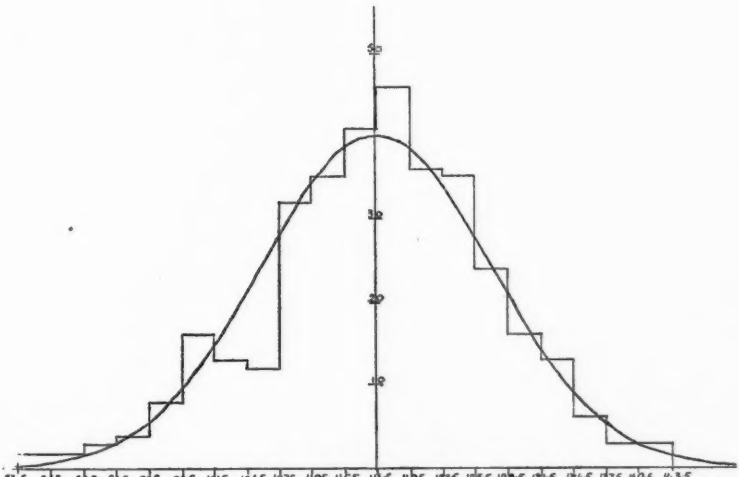
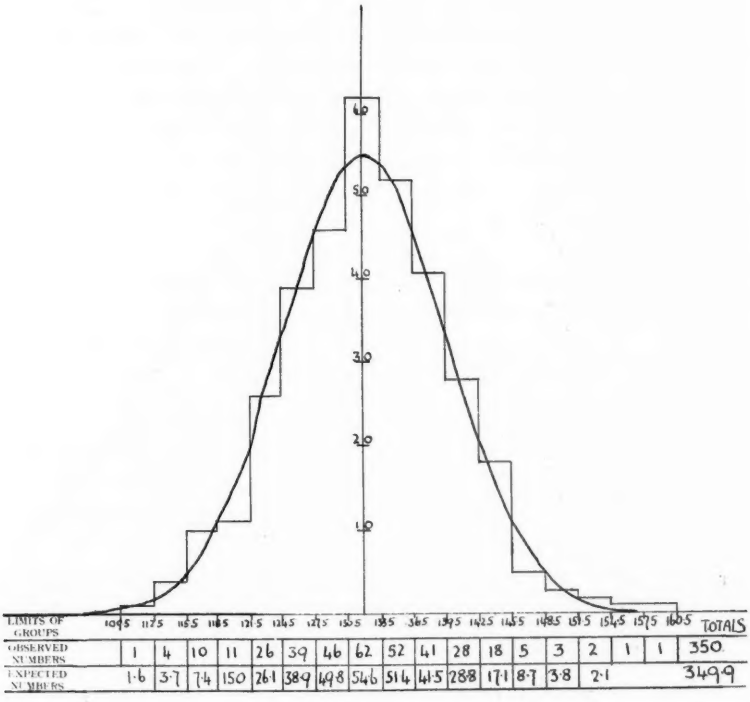


LIMITS OF GROUPS	83·5	88·5	93·5	98·5	103·5	108·5	113·5	118·5	123·5	128·5	133·5	138·5	143·5	148·5	153·5	158·5	163·5	TOTALS
OBSERVED NUMBERS	2	2	3	4	8	16	13	12	32	35	41	46	36	35	24	16	13	6	3	3	350
EXPECTED NUMBERS		1·8	2·2	4·2	7·3	11·8	17·7	24·4	31·0	36·4	39·6	39·3	36·1	30·7	24·0	17·3	11·6	7·1	4·0	3·8	350·1

FIG. 1.

Frequency distribution of the conjugate diameter with normal curve. Mean, 116.4 mm. Standard deviation, 10.5 mm.

χ^2, 14.8. *n*, 18. *P*, 0.68.

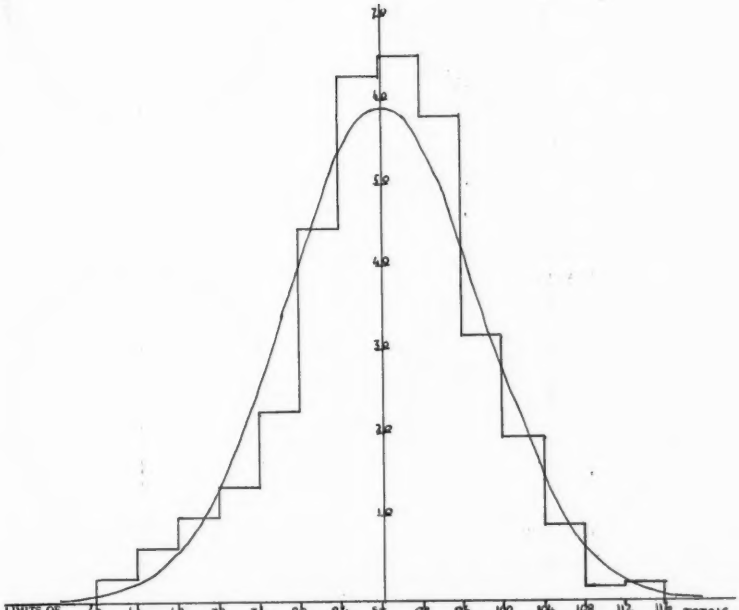


LIMITS OF GROUPS	1095	1175	1165	1185	1215	1245	1275	1305	1335	1365	1395	1425	1455	1485	1515	1545	1575	1605	TOTALS
OBSERVED NUMBERS	1	4	10	11	26	39	46	62	52	41	28	18	5	3	2	1	1		350
EXPECTED NUMBERS	1·6	3·7	7·4	15·0	26·1	38·9	49·8	54·6	51·4	41·5	28·8	17·1	8·7	3·8	2·1				3499

FIG. 2.

Frequency distribution of the transverse diameter with normal curve. Mean, 132.3 mm. Standard deviation, 7.6 mm.

χ^2, 7.3. *n*, 14. *P*, 0.92.



LIMITS OF GROUPS	60	64	68	72	76	80	84	88	92	96	100	104	108	112	116	TOTALS.
OBSERVED NUMBERS	3·0	6·5	10·0	13·5	22·5	44·5	63·0	65·5	58·0	31·5	19·5	9·0	1·5	2·0		350
EXPECTED NUMBERS	1·7	3·7	9·2	19·0	32·7	47·2	57·2	57·9	49·1	34·9	20·7	10·3	4·3	2·1		350·0

FIG. 3.

Normal curve for the pelvic index with the observed figures superimposed. Mean, 88.3 mm. Standard deviation, 9.45 mm.
χ^2, 13.6. *n*, 13. *P*, 0.40.

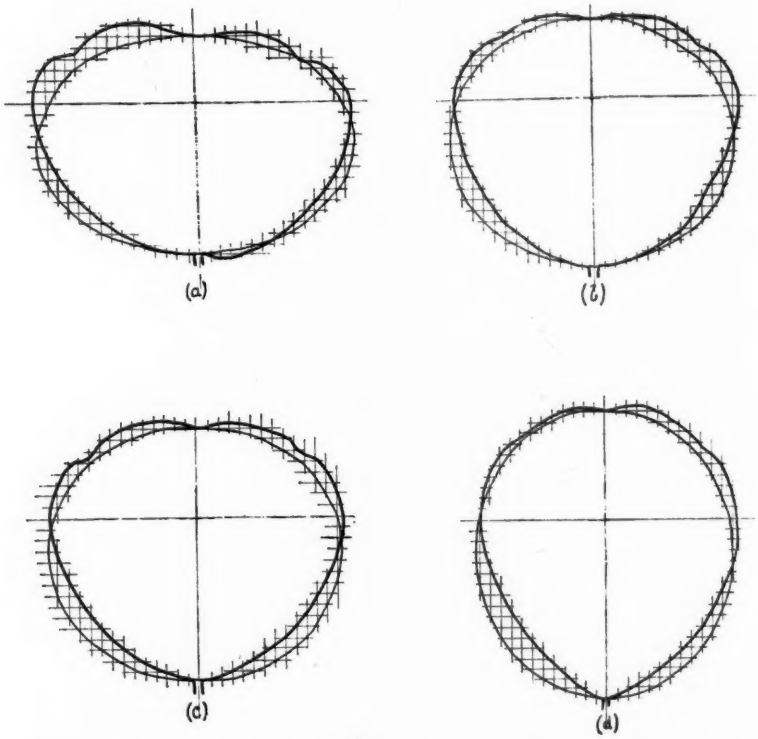
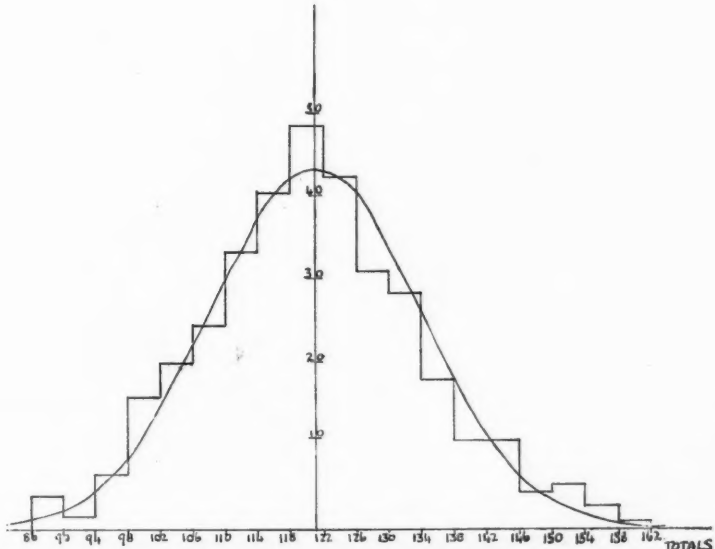


FIG. 4.

Tracings of the outlines of four pelves with superimposed ellipses, to show closeness of approximation to the area.

	Pelvic index	Estimated area	Actual area	Difference
(*a*)	67	115	117	−2 sq. cm.
(*b*)	86	112	111	+1 sq. cm.
(*c*)	83	124	122	+2 sq. cm.
(*d*)	110	112	107	+5 sq. cm.



LIMITS OF GROUPS	88	92	96	98	102	106	110	114	118	122	126	130	134	138	142	146	150	154	158	162	TOTALS
OBSERVED NUMBERS	4·0	1·5	6·5	16·0	20·0	24·5	33·5	40·5	48·5	42·5	31·0	28·5	18·0	10·5	10·5	4·5	5·5	3·0	1·0		350
EXPECTED NUMBERS	2·9	3·6	6·8	11·7	18·3	26·1	33·9	39·9	42·9	41·8	37·1	30·0	22·0	14·7	9·0	5·0	2·5	1·9			350·1

FIG. 5.

Normal curve for the approximate area at the brim, with the observed figures superimposed.

Mean, 121.0 sq. cm. Standard deviation, 12.9 sq. cm.

χ^2, 14.1. n, 17. P, 0.66.

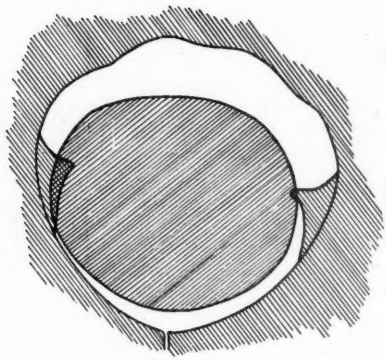


FIG. 6.

Tracing of a radiogram showing the flexed foetal head engaged in the brim at the onset of labour.

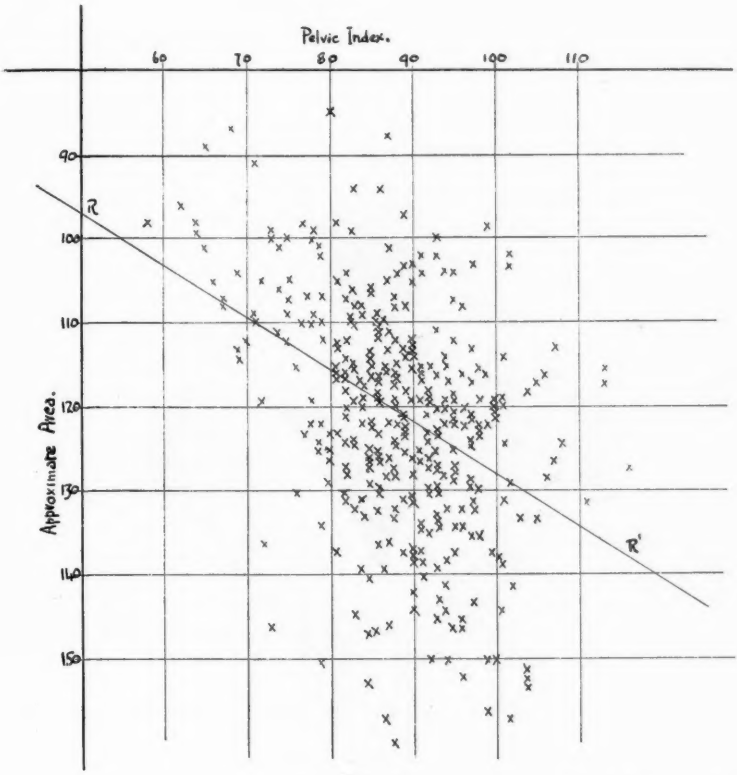


FIG. 7.

Scatter diagram of the distribution of 350 pelves according to pelvic index and approximate area.
Correlation coefficient, 0.432. Standard error, 0.043.

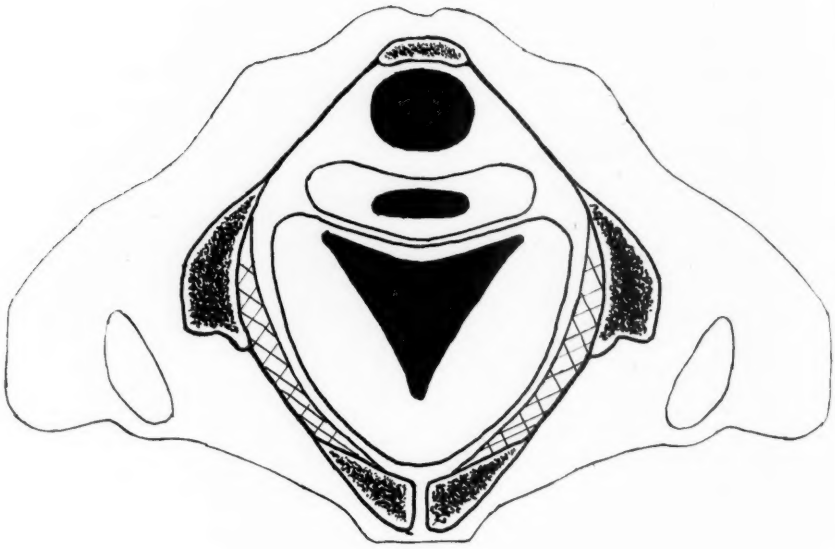
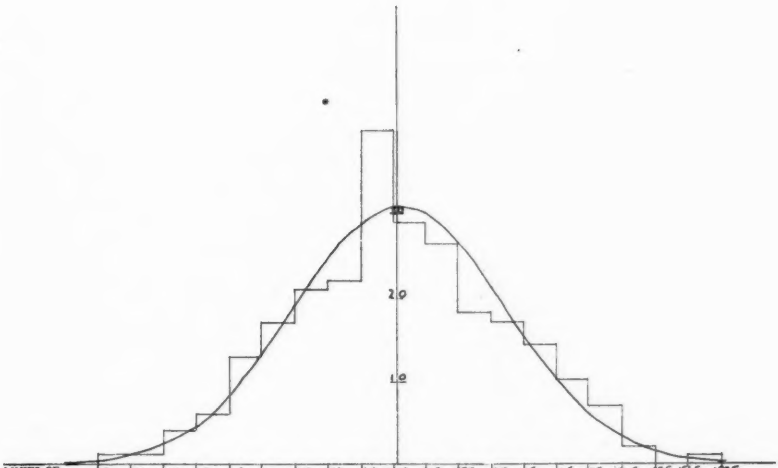


FIG. 8.
Diagrammatic view of the plane of least pelvic diameter seen from below.



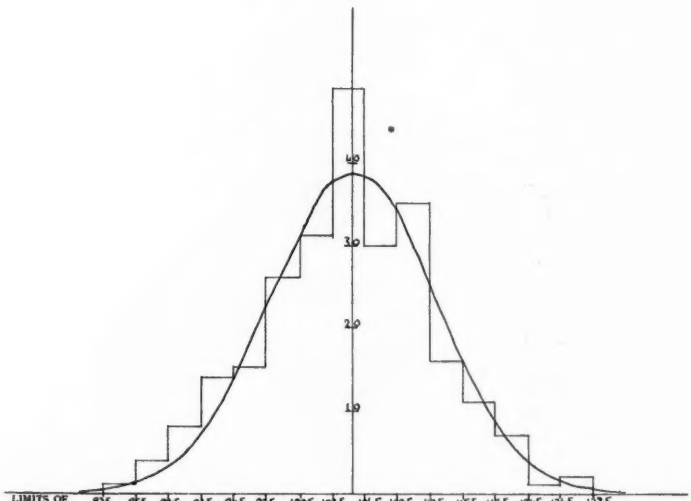
LIMITS OF GROUPS	1025	1055	1085	1115	1145	1175	1205	1235	1265	1295	1325	1355	1385	1415	1445	1475	1505	1535	1565	1595.	TOTALS.
OBSERVED NUMBERS	1	1	4	6	13	17	21	22	40	29	27	18	17	14	10	7	2	0	1		250
EXPECTED NUMBERS	1·4	1·8	3·6	6·5	10·7	16·0	21·8	26·9	30·2	30·8	28·5	24·0	18·3	12·7	8·0	4·6	2·4	1·9			250·1

FIG. 9.

Frequency distribution of the antero-posterior diameter of the outlet with normal curve.

Mean, 130.1 mm. Standard deviation, 9.6 mm.

χ^2, 9.3. n, 17. P, 0.93.



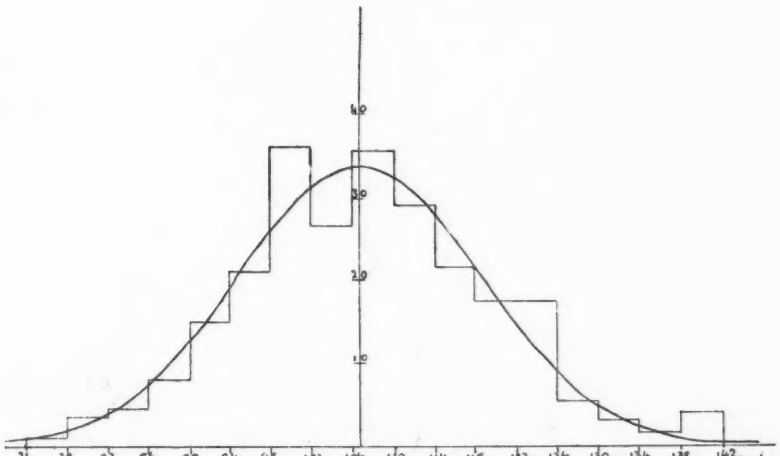
LIMITS OF GROUPS	82.5	85.5	88.5	91.5	94.5	97.5	100.5	103.5	106.5	109.5	112.5	115.5	118.5	121.5	124.5	127.5	TOTALS.
OBSERVED NUMBERS	1	4	8	14	15	26	31	49	30	35	16	11	7	1	2		250
EXPECTED NUMBERS	1·3	2·4	5·5	10·9	18·6	27·5	35·0	38·4	36·4	29·6	20·8	12·6	6·6	2·9	1·7		250·2

FIG. 10.

Frequency distribution of the diameter between the ischial spines with normal curve.

Mean, 105.4 mm. Standard deviation, 7.7. mm.

χ^2, 12.3. n, 14. P, 0.59.



LIMITS OF GROUPS	76	78	82	86	90	94	98	102	106	110	114	118	122	126	130	134	138	142	Totals.
OBSERVED NUMBERS	1·0	3·5	4·5	8·0	15·0	21·0	36·0	26·5	35·5	24·0	21·5	17·5	17·5	5·0	3·0	1·5	4·0		250.
EXPECTED NUMBERS	1·7	2·5	5·0	9·1	14·7	21·4	27·7	32·2	33·4	30·9	25·6	19·0	12·5	7·4	3·9	3·1			250·1

FIG. 11.

Normal curve for the approximate area at the outlet with the observed figures superimposed.

Mean, 106.7 sq. cm. Standard deviation, 11.9 sq. cm.

χ^2, 10.3. n, 15. P, 0.74.

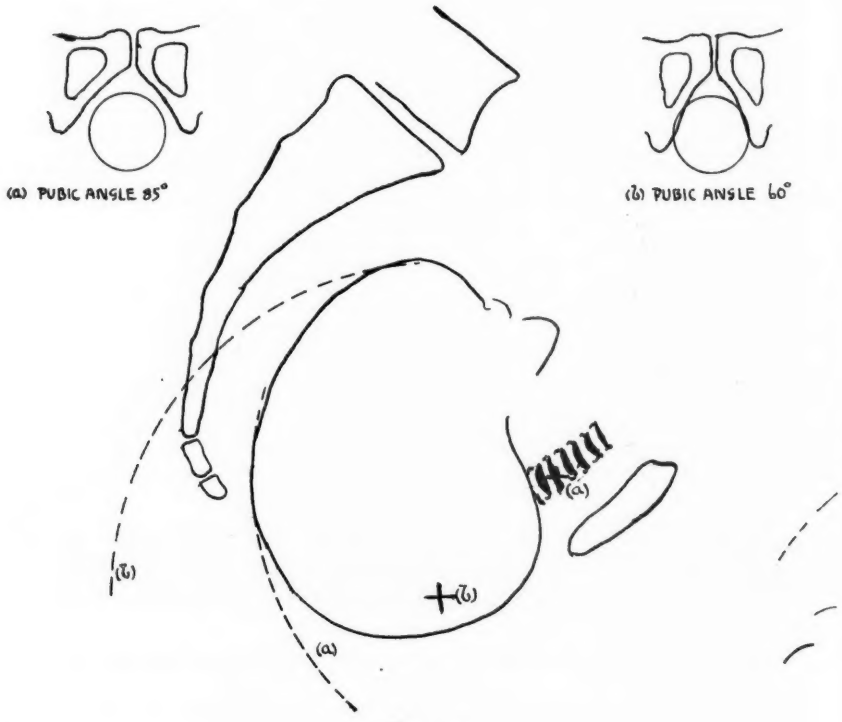
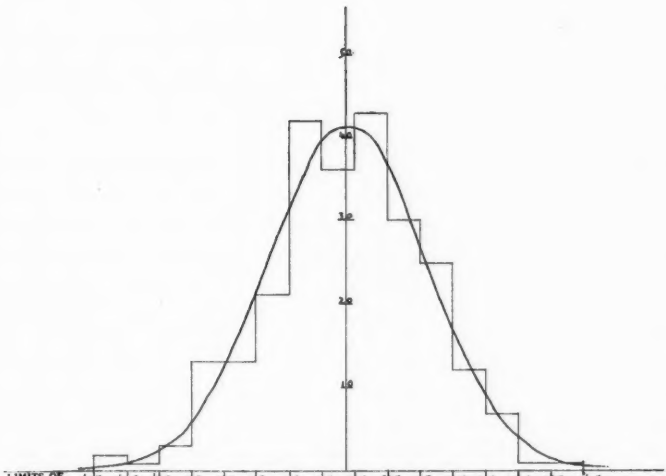


FIG. 12.
Diagram of the extension of the foetal head through a normal and through a contracted pubic arch.



LIMITS OF GROUPS	64·5	64·5	67·5	70·5	73·5	76·5	79·5	82·5	85·5	88·5	91·5	94·5	97·5	100·5	103·5	106·5	TOTALS
OBSERVED NUMBERS	2	1	3	13	13	21	42	36	43	30	25	12	7	1	1		250
EXPECTED NUMBERS	2·2		4·0	8·9	16·8	26·7	35·8	40·7	39·1	31·7	21·7	12·6	6·2	2·5	1·2		250·1

FIG. 13.

Frequency distribution of the subpubic angle with normal curve. Mean, 84.8 degrees. Standard deviation, 7.3 degrees.

χ^2, 8.3. n, 13. P, 0.83.

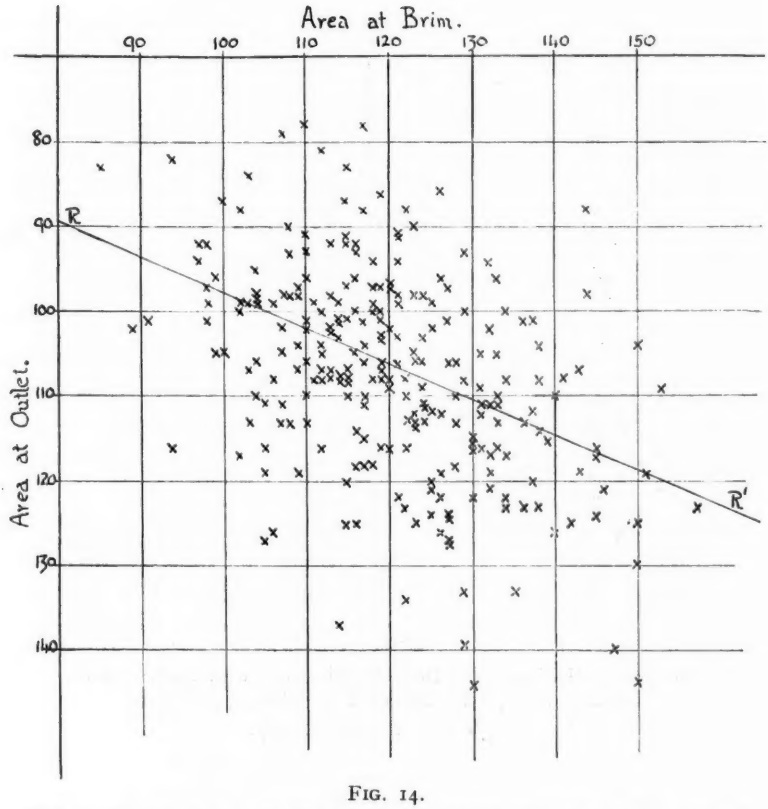


FIG. 14.

Scatter diagram of the distribution of 250 pelves according to area at the brim and area at the outlet.
Correlation coefficient, 0.446. Standard error, 0.051.

Puerperal Cervicitis*

Observations Based on a Series of 82 Cases Treated at Queen Charlotte's Hospital.

BY

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It is only within the last 30 years that the crippling effect of chronic cervicitis has been fully realized. The syndrome of leucorrhoea and backache is probably the commonest met with at gynaecological clinics, and in cases which have persisted for any length of time it is not uncommon to find extension of the inflammatory process upwards, producing a chronic endometritis which may ultimately necessitate a total hysterectomy. Lymphatic extension to the trigone of the bladder may also occur, and there is considerable evidence that metastatic infection, producing such lesions as rheumatoid arthritis and irido-cyclitis, may occur about the time of the menopause. The relation of carcinoma of the cervix to child-bearing is well known, and chronic cervicitis is generally held to be the most important predisposing factor.

Young,[1] in a recent article, stated that the majority of cases of chronic cervicitis occur in parous women, and that in 90 per cent of these cases the symptoms could be traced definitely to a confinement. The results of treatment vary considerably according to the method used. In Young's series of 183 cases treated by radial incision with the electro-cautery after a preliminary dilatation of the cervix, complete relief was obtained in 46.4 per cent of patients, and cure or partial relief in 80 per cent. Bearing all these facts in mind, the importance of the results of early treatment of the cervical lesion, before the infection has become well established, can be readily appreciated. Furthermore, it was hoped that by studying a series of patients with puerperal cervicitis—that is, patients seen within a few weeks of childbirth—some new facts with regard to the causation of the lesion might be elucidated.

* Thesis approved for the degree of Doctor of Medicine in the University of London.

Aetiology.

The pathology of cervicitis is too well known to necessitate here a detailed description, but there is a considerable divergence of opinion as to the manner in which an erosion of the cervix actually arises. The generally accepted view (Holden[2]) is that, as a result of infection there is an increase in the secretion of the cervical glands. The stratified squamous epithelium of the vaginal portion of the cervix, which is generally accustomed to a slightly acid medium, is then constantly bathed in slightly alkaline mucus which causes the superficial layers to become soggy and macerated. This, combined with subepithelial round-cell infiltration, causes a complete loss of the squamous epithelium, with the formation of a true erosion. The later evidences of the lesion, which are seen when the surface is again covered with epithelium, should properly be called various stages of healing erosion.

Roser[3] stated that erosion of the cervix occurs as a result of the pushing forward of the mucous membrane of the cervical canal through swelling, and Kelly[4] regarded erosion as due to an infection of the cervical glands which causes the mucosa to swell up and roll out into the vagina, making it an eversion of the cervical mucosa in an intact cervix. Eversion or ectropion of the cervical canal may occur mechanically from laceration of the cervix, with scar-tissue formation and contraction causing the cervical canal to be exposed into the vagina. Adair[5] stated that eversion or ectropion does not signify erosion, but is often associated with it, and can, in all probability, be a factor in the formation of any erosion. Now microscopical sections of cervical ectropion show all the typical features of early cervicitis, and it is quite impossible microscopically to distinguish between ectropion and erosion of the cervix. Ectropion must, however, be clearly distinguished from an uninfected torn cervix, in which healthy squamous epithelium has covered the exposed surfaces. Such a cervix may show marked irregularities, but as a rule does not give rise to any symptoms.

Small cracks or fissures radiating from the external os are very common after childbirth, and not infrequently result in infection. Goodall and Wiseman[6] have pointed out that the lacerated cervix rests in a pool of lochia, and since the lochia are not sterile after the third day, the contused tissues cannot resist the organisms, and become infected. Such infection may not be of sufficient virulence to produce post-partum morbidity, yet

it interferes with the healing of the laceration. It is postulated that these small tears are the essential cause of a puerperal erosion, that they provide the site of entry for organisms to reach the tissues of the cervix. They are not clearly seen in cases of long standing because of scar contraction, but in the recent puerperal erosion they can always be demonstrated on careful inspection. The desquamation of the epithelium of the vaginal portion of the cervix is probably accelerated by its maceration from contact with the mucoid discharge, but this cannot be the only factor, otherwise erosion of the posterior vaginal wall, with which the cervix is in close contact, would also occur. It will, therefore, be apparent that the essential pathology of cervical erosion and ectropion is identical, and similar treatment should be adopted for these two lesions.

Swabs taken from the cervical canal in cases of puerperal cervicitis are usually reported sterile, or a staphylococcus albus may be grown, probably due to contamination. If a culture is made directly on to a blood-agar plate, a non-haemolytic streptococcus is grown in nearly every case. This finding confirms the work of Everard Williams[7] in cases of chronic cervicitis.

An analysis of the labour ward records at Queen Charlotte's Hospital has been made in 70 cases of puerperal cervicitis, occurring either in primiparae, or in multiparae in whom the onset of symptoms dated from the recent confinement. It should, however, be borne in mind that a few cases in either group may have had a pre-existing cervicitis.

Method of delivery	Primiparae	Multiparae
Spontaneous vertex	37	24
Forceps	3	2
Assisted breech	1	2
Spontaneous face	0	1
Total number of cases	41	29
Early rupture of the membranes occurred in	21	18

It is difficult to draw very definite conclusions from these records, but tabulation of the method of delivery shows that the majority of cases followed comparatively normal labours. Interference with the course of labour, while it may admittedly result in a torn cervix or ectropion in some instances, is not an impor-

tant factor in producing cervicitis. It will readily be conceded that assistance in labour is rarely invoked until the cervix is fully dilated, and is therefore unlikely to be further traumatized. On the other hand, it is generally agreed that interference before full dilatation is almost inevitably followed by infection of the torn cervix, unless the tear is adequately repaired after labour.

Closer study of the cases in which the delivery was normal shows that most of them can be grouped into one of two categories. In 27 cases the total duration of labour was 10 hours or less, and the average weight of the baby was 8 pounds. In this group the strongly contracting uterus presumably forced the foetal head through the cervix before dilatation was absolutely complete. In 16 cases the duration of labour was 24 hours or more, and the average weight of the baby was 7 pounds 6 ounces. In this group there was presumably a long first stage, often with the membranes ruptured, during which the dilating cervix was being traumatized. The possibility of there being minor degrees of disproportion between the foetal head and the pelvis in these cases is impossible to assess, owing to the absence of accurate measurements. Such disproportion might be inferred from the length of labour in the second group, and in the first group it was noted that the weight of the baby was usually above the average.

Early rupture of the membranes, occurring either before the onset of labour or early in the first stage, was noted in about 50 per cent of all the cases. This very significant fact can only mean that the bag of membranes normally protects the cervix from injury during dilatation, and that such injury is the essential cause of puerperal cervicitis. In 11 cases in this series cervicitis followed labour which had been induced by artificial rupture of the membranes. Three of these were patients with ante-partum haemorrhage, in which rupture of the membranes was a necessary part of the treatment, but 8 were uncomplicated cases. In most of these the baby was large in proportion to the birth-canal, but it is in this type of case particularly that the bag of membranes is most needed to prevent injury to the cervix. This must, therefore, be admitted as an argument against the use of this method of inducing labour, except conditions of urgency, such as accidental or unavoidable haemorrhage.

Symptomatology.

The commonest symptom of cervical infection after childbirth is a vaginal discharge, which is mucous or muco-purulent

in character and does not produce any irritation. The amount of discharge varies considerably, and is often greater with endocervicitis alone than with a large erosion of the vaginal aspect of the cervix. Furthermore, many patients with cervicitis do not complain of any discharge. This may be because it is but slight and unnoticeable, or because the patient does not like to admit that she has any discharge, and may even regard it as normal. This is of importance, as it shows the necessity of a routine speculum examination in all post-natal cases. Other causes of vaginal discharge must, of course, be considered, and they may co-exist with cervicitis. Granulating tears of the vaginal mucosa may be present, and a trichamonad vaginitis is not uncommon after childbirth, but the discharge in this case is always accompanied by irritation, and the characteristic reddish flecks on the mucosa may be seen.

Backache, which is very constant in chronic cervicitis, is common but by no means invariable in puerperal cases. The cervix is not tender on palpation; dyspareunia is rarely present, and if present would rather suggest some other lesion, such as retroversion or parametritis. The backache, when present, is always felt across the upper two sacral segments, and is, therefore, easily distinguished from the pain of such conditions as sacro-iliac strain or lumbar fasciitis. It is clearly a referred pain, but the fact that it is not constant in early cervicitis suggests an origin, not from the cervical lesion, but possibly from the related lymphatic glands in the parametrium.

Treatment.

Numerous methods of treatment have been advocated for cervicitis, whether of recent origin or of long standing. The application of antiseptics to the cervix in chronic cervicitis is now recognized to be of no value, and it has been found to be equally useless for the puerperal case. The most effective treatment of cervicitis appears to be the destruction of the superficial tissues of the cervical erosion and canal by some form of cauterization. In an attempt to provide a method suitable for out-patient treatment Bourne[8] has advocated the use of a saturated solution of zinc chloride applied to the cervical canal in a porous clay pencil. This technique is not easy, and necessitates keeping the patient on her back for two to four hours. Of the 41 cases re-examined Bourne reported 29 completely cured, partial or complete failure occurring in 28.6 per cent. While the

method is most effective in eradicating endocervicitis, it is found to be of little use for cervical erosion, and is inapplicable to a deeply lacerated everted cervix.

The use of the cautery in the treatment of cervical lesions was begun by Byrne in 1892 in treating carcinoma of the cervix. Hunner[9] was the first to use the paquelin cautery in endocervicitis and Dickenson[10] began the use of the fine wire nasal-tip cautery. Cauterization of the cervical lesions is usually performed as an in-patient treatment, under an anaesthetic, in order that the cervical canal may be dilated before it is cauterized. This dilatation is necessary for chronic cervicitis, when the canal has contracted down; it is unnecessary in the post-natal case, when the external os is still patulous as a result of small tears. The cervix is comparatively insensitive, and there is rarely any difficulty in cauterizing the erosion and cervical canal without anaesthesia.

In the present series of cases, cauterization was performed with the galvano-cautery, using Gray's heavy pattern with rounded point, the erosion or ectropion being destroyed by radial strokes of the cautery, which was then passed more deeply into the tears and cervical canal. There was only one patient whose nervous condition made it necessary to give an anaesthetic, and 5 c.c. of sodium evipan were given. The patients were not kept in hospital. Special after-treatment was not given, and the patients were asked to report again in six weeks. In a few cases it was found necessary to re-cauterize small unhealed areas on the cervix, or perhaps a persistent endocervicitis.

Sixty patients so treated were followed up, and the results of treatment have been tabulated here.

	Number of cases	Symptomatic cure	Condition of cervix		
			Perfect	Satis-factory	Unsatis-factory
		per cent			
Primiparae	29	26, or 89	23	6	0
Multiparae (recent discharge)	19	15, or 79	11	6	2
Multiparae (pre-existing discharge)	12	6, or 50	4	6	2
Totals	6	47, or 78	38	18	4

Patients without any discharge or sacral backache were regarded as symptomatic cures. The cervix was described as perfect when there was not any discharge noticed on examination, and the mucosa covering it was smooth and pearly-grey all over. In some of these patients the cervix showed irregularities from tears, which were, however, completely healed over. In the cases described as satisfactory there was slight or not any discharge seen, and the cervix was healed over, but in many of these cases there was a somewhat mottled appearance, which suggested some persistent infection underlying the epithelium.

With regard to the symptomatic failures, most of them complained of a slight mucoid discharge, which was probably endocervical in origin: there was definite evidence of this in two cases, classed as unsatisfactory, in which the canal was re-cauterized. Only two cases of unhealed erosion were found, one of which was definitely gonococcal, possibly re-infected from her husband, and the other was in a patient who was again pregnant.

It will be noted that the percentage of imperfect results is higher in multiparae than in primiparae, and highest in multiparae in whom the lesion is of long standing. The symptomatic cure-rate in lesions dating from the recent confinement is 85 per cent, whereas in chronic cases it is only about 50 per cent, as Young has already shown. It follows from this that cauterization is a very satisfactory treatment for recent puerperal cervicitis, when the infection is comparatively superficial, but it is not so effective in chronic cases in which the infection has penetrated the deeper tissues of the cervix. These latter cases would, perhaps, be more adequately treated with the surgical diathermy needle.

Conclusions.

Summarizing the results of this investigation it has been shown that:—

(1) It is of great importance to treat cases of cervicitis early, before the lesion has become chronic and deep-seated.

(2) The infection is due to a non-haemolytic streptococcus, but the essential cause of the lesion is trauma, and the histology of puerperal cervicitis is identical with that of ectropion.

(3) The most frequent single factor responsible for this trauma is early rupture of the membranes, which is, therefore, inadvisable as a method of inducing labour.

(4) Treatment by cauterization can be carried out as an out-patient method, without special preparation or after-treatment.

(5) Partial failure may be due to inadequate treatment of the endocervicitis, which is probably present in all cases.

(6) Cauterization is far more efficacious in recent cervicitis than in cases of long standing, in which the infection is no longer superficial.

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Study of Placental Site and Intra-Uterine Relation By Original Method of Amniotic Sac Distension

Report of 144 Cases

BY

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MUCH study has been devoted to the micropathology of the human placenta in relation to toxaemias, infections, and vascular changes.[1, 2, 3, 4] Much study has also been expended in regard to the histologic development, so that by the time of Webster,[5] 40 years ago, he could write a classic work on this subject and was one of the first to give correct origin to various histologic structures. However, the great subject of the formation of the shape of the human placenta, and its relation to various possible intra-uterine sites, has been essentially a matter of conjecture. Likewise much speculation and very little light have been shed upon the important subject of the edge of the placenta, whether normal, marginate, or circumvallate.[6] Very little can be gained from comparative placentation, for in this subject there is probably wider variation from lower forms than in any other in anatomy and in embryology. Even the related primates have a considerably different type of placenta.[7]

It was in an attempt to elucidate this subject that this method was accidentally discovered. Recently described in the *American Journal of Obstetrics and Gynecology*,[8] it is briefly as follows:

In about 25 per cent of all deliveries the placenta and attached membranes are complete, with the exception of the foetal head-size rent over the cervical area, through which the foetus emerged. By submerging this sac in a tank of fluid up to the cervical tear it may be distended by introducing a known quantity of fluid, so that the sac assumes the shape and size of the uterine cavity from which it came. This is pyriform, pointing toward the cervix, and in 19 out of every 20 cases the sac presents definite lateral bulges in the fundal portion which have proved to be at the site of the uterine horns. Proof of this has been accomplished in several

ways. First, marking the sac with sterile dye as it emerges under the urethra when subsequent distension of the sac has shown the bulges to be at the location of the horns. Second, in several cases of Caesarean section the specimens have definitely shown that the bulges are over the horns. In fact, without other knowledge, I was able to state that 2 sacs came from Caesarean section cases. Third, in 6 cases of hysterectomy at various stages of pregnancy hypertension and chronic nephritis, the uteri were hardened in formalin before opening. When later bisected these sacs invariably were bulged over the uterine horn-areas to conform to the shape of the uterus. These bulges are not artefacts due to pressure of the stream of the filling fluid, because keeping them on ice for days at a time does not change the contour nor does it alter the size of the sac. They will take essentially the same amount of fluid repeated daily if they are kept in a refrigerator. The amount of fluid to distend the sac to the cervical rent corresponded, within 1 or 2 per cent, with the quantity of amniotic fluid plus the baby volume in the few cases correlated. This is subject to further investigation. Furthermore, there is very little change in the volume (not over 1 or 2 per cent) when the intra-sac fluid pressure is varied from 1 to 20 centimetres of water.

In 444 such sacs the following records were kept. A clay model of the shape of the sac with the placenta mapped on the surface, volume of sac in cubic centimetres, area of placenta found by outline on a glass plate pressed against its foetal surface. This spreads the surface to such an extent that the area may be almost as accurately mapped as by a method first attempted of measuring on a curved surface. The area of the placenta was found by counting the square centimetres over charting paper, although a planimeter might well be used. The placenta weight is recorded in grammes and the area of the sac found by the formula $\begin{matrix} r = \sqrt{\frac{3 \times \text{volume}}{4\pi}} \\ \text{area} = 4\pi r^2 \end{matrix}$, considering the sac a sphere. The error in this is probably not over 1 per cent. We are now working out a corrected formula for future work inasmuch as the sacs in general conform to a pyriform shape.

Since 95 per cent of the sacs had the cornual bulges, localization of the placentae was accurate in most cases. Of the 444 specimens 380 (85.5 per cent) were circular, with a very few oval. These were in almost every case located on the relatively flat anterior or posterior wall. The exceptions were 6, and these were

located directly over a horn, 4 of them circumvallate and 2 with normal edge. Twenty-three others (about 5 per cent) were bilobate with 2 lobes more or less equal in size. In all of these except 1 case the line between the 2 lobes lay on that separating the 2 flat surfaces of the uterus. In fact there is apparent from this study a very definite line or crease up one side of the uterine cavity, crossing at the apex and extending down the other side of the fundus. If the placenta lay over this line or crease, it almost invariably had 2 lobes, which may be, however, so unequal in size that in 10 other cases it occurred as a large lobe with a beginning smaller lobe, and in 16 others the main placenta located in the anterior or posterior wall with 1 or more very small lobes, 4 to 5 centimetres in diameter, peeking over the side or apex of the fundus. In only 4 cases did this result in true succenturiata with small lobes well separated. These lay across that line on to the other surface. The largest placenta was bilobate, 1 lobe extending over the apex of the fundus from within 5 centimetres of the cervix anteriorly to about 16 centimetres from it posteriorly. This placenta covered 552 square centimetres and weighed 1,039 grammes. The child's weight was 3,624 grammes and the sac-volume about 4,000 cubic centimetres. There was 1 circular placenta of about as great an area and weight.

Placental Margin.

The placental margin was studied in each of the 1,841 placentae comprising this study. Inasmuch as the percentage in the entire group was about the same as in those with sacs intact enough for study by distension only these will be given. In this group of 444 there were 317 (71 per cent) with perfectly normal edges, i.e. there was gradual and uninterrupted change from live chorionic villi of the thick placenta to the atrophic necrobiotic ones of the thin membranes. In 108 (about 25 per cent) there was marginal infarction occurring in a white rim a few millimetres to several centimetres wide. The so-called placenta marginata lay back over the foetal surface of the placenta. In 50 per cent of these this extended over only one-fourth of the circumference, in 25 per cent over one-half, and in 25 per cent it was total.

In 17 cases (3.8 per cent) the margin was typically circumvallate. In the total of 1,841 placentae, however, there were 42 circumvallate, being 2.3 per cent. In a paper[9] before the Chicago Gynecological Society in 1931 I postulated that normal placenta occurred when implantation of the ovum took place on the

anterior or posterior wall, that placenta marginata resulted from implantation in the narrow crease at the sides of the uterine cavity, and that placenta circumvallata arose from implantation in a uterine horn. This study does not confirm that part of the thesis. The great percentage of cases of marginata occurred in placentae on the anterior or posterior wall, and marginata was not common in bilobate placentae. They did not have any general reference to a cornual location.

Seventeen cases of placenta circumvallata had the following locations: 4 cases, or 25 per cent, definitely uterine horn. However, with the small number they were the great majority of all that did occur over the horn in the 444 cases. Nine cases, or about one-half of the circumvallata, occurred definitely over flat anterior or posterior wall usually rather high in the fundus. The remaining 25 per cent were indeterminate as to exact location inasmuch as the horns were not very well marked.

Umbilical Cord Insertion.

The insertions of the umbilical cord were noted in all the placentae. It is uncanny the precision with which the body-stalk is able to attach itself to the point in the amniotic sac over which the future placenta will grow. In 440 of the 444 cases one was able correctly to predict the placental site. In over one-half of the cases the umbilical cord was inserted within a few centimetres of the centre of the placenta. In the other 4 cases there was resultant velamentous insertion. One of these occurred in a case of bilobate placenta in which the placenta crossed over one side of the uterus and the foetal vessels grew from each lobe to join the cord inserted in the membranes on the opposite side. A careful study of the insertion of the umbilical cord in each of these 444 cases did not reveal any relation with placenta marginata, and none whatsoever to the intra-uterine site except in bilobate placenta, when it is likely to be on a line dividing the 2 lobes.

Ratio of Placental Area to Sac Area.

Dr. Philip Dow, of the Department of Physiology of the University of Georgia School of Medicine, made a study of 216 cases correlating volume of sac, area of sac, placental weight and area, and baby-weight. He found high correlation between weight and area of placenta and nearly as good between baby-weight and sac-volume or sac-area. He also found that the

placenta covers a relatively larger area in the smaller abortion and premature sacs than in the larger ones—full time or hydramniotic sacs.

In the series of 26 cases of sac-volume, 0 to 3,000 cubic centimetres, the placenta covered 28.5 per cent of the sac; in 125 cases of 3,000 to 4,400 cubic centimetres, 25 per cent; and in those 51 above the volume of 4,400 cubic centimetres, 21.5 per cent. Such a study applied to the whole series of 444 cases revealed 9 sacs with a volume of 0 to 1,000 cubic centimetres with placentae covering 37.5 per cent; 9 sacs, 1,000 to 2,000 cubic centimetres, 33 per cent; 2,000 to 3,000 cubic centimetres, 28.5 per cent; 3,000 to 4,000 cubic centimetres, 26 per cent; 4,000 to 5,000 cubic centimetres, 24 per cent; 5,000 to 6,000 cubic centimetres, 21.8 per cent; 6,000 cubic centimetres and above, 21.7 per cent. While the extremes of these contain only a few specimens, it can be stated definitely that the placenta in the early stage is relatively larger in many cases. Now what takes place to reduce the size? The placenta is a fixed organ with each cotyledon attached to its relative place in the uterine wall. If it covers 25 per cent in the early stage, it will grow in compensation with the portion of the uterine wall to which it is attached and at term will still cover 25 per cent. However, if it covers relatively more than that in the early stage, the excess margin must be gradually pulled off from the wall; the villi must become atrophic and with a small layer of decidua be folded over the edge of the placenta to form marginata (in case it had never covered more than one-half the area). In case the early placenta covers more than one-half the area of the sac, it without doubt forms an annulus fibrosus through which the baby herniates, detaching the wide rim of the excess placenta, which, falling back on to the placenta, forms circumvallata.

This study confirms the main thesis of the paper referred to, and in addition it produces evidence to explain many abortions, i.e. in the process of detaching the excess rim of the chorionic villi from the uterine wall and folding it back to form the infarct ring in placenta marginata, or in rarer extreme cases of placenta circumvallata, there is not infrequent rupture of a large decidual (maternal) vessel which results in retroplacental haemorrhage, stimulation of uterine contractions, and ultimate abortion. Placenta marginata and placenta circumvallata illustrate those cases in which, although the placenta was relatively too large, the reduction in size took place without rupture of large vessels

in the decidua, and consequently they went to term. To me it illustrates Nature's marvellous ability to extract herself from a compromising position, which she must do in almost one-half of all human pregnancies Her infrequent failure explains many otherwise obscure abortions.

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Some Aspects of the Pathology of Uterine Fibromyomata during Pregnancy

BY

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IN the comparatively small proportion of cases of uterine fibromyomata in women who become pregnant it is the rule rather than the exception for degenerative changes to occur in the tumours, either during pregnancy or during the puerperium. Campbell[1] states that 78 per cent of tumours removed during pregnancy are necrobiotic as compared with 7.8 per cent of tumours removed from women not pregnant.

This tendency of fibroids to degenerate during pregnancy appears to depend on several factors connected with an interference of the blood-supply of the tumours.

The blood-supply of all fibroids is limited. Wilfred Shaw[2] states that all fibroids over 1½ inches in diameter show the presence of degeneration. This is due to the firm fibrous nature of the tumour which precludes the admission of more than a minimum blood-supply.

In pregnancy, however, these tumours grow considerably and soften in response to the same hormones which control the growth of the parent uterus. This growth and softening is presumably due to the enlargement of the individual muscle fibres, as has been shown to occur in the normal uterine muscle during pregnancy.[3] This growth very soon outstrips the blood-supply and degeneration occurs in the centre of the tumour.

Another factor concerned in the causation of degeneration during pregnancy is the thinning out of the uterine wall (to about 3 to 5 millimetres) which occurs after the first few months of pregnancy. Thus a fibroid of the uterus which may have been completely surrounded by vascular uterine muscles must necessarily become either subperitoneal or submucous—usually subperitoneal since the positive pressure within the uterus, especially during the intermittent contractions of the uterus, tends to extrude the fibroid outwards as illustrated by the following.

CASE 1. A woman, 28 years of age, complaining of sterility, was examined under an anaesthetic and found to have a bulky uterus, especially in the region of the fundus. The uterine cavity, however, was not enlarged. A diagnosis of interstitial fibroid was made. Myomectomy was advised, but was refused. The patient returned 6 months later and was then about 18 weeks pregnant. (She generously attributed her pregnancy to the examination under an anaesthetic.) The tumour was then clearly a subperitoneal pedunculated fibroid and was causing great pain and a slight rise in temperature, indicating that it had undergone degeneration. An easy myomectomy was performed (perhaps rather unnecessarily, since the acute symptoms of a degenerating fibroid during pregnancy nearly always subside spontaneously). The tumour was then about the size of a navel orange and showed extensive necrobiosis.

In this case the tumour was presumably exteriorized by the thinning out and contractions of the uterus, thus interfering with the blood-supply of the fibroid and so resulting in red degeneration.

It is not claimed that all fibroids are so exteriorized. Indeed cervical fibroids are not subject to the extruding tendency of the uterine contractions. Yet it is known that they do occasionally degenerate during pregnancy. This is explicable on the grounds of growth in response to hormonic influence, which has outstripped the blood-supply.

During the puerperium red degeneration is even more common than during pregnancy, but a somewhat different set of aetiological factors is operative. The uterus immediately after delivery becomes blood-tight and so all uterine fibroids are suddenly subjected to a great diminution in blood-supply, which in many cases precipitates degenerative changes. Furthermore, interstitial and submucous fibroids are directly compressed by the tightly contracted uterus.

CASE 2. A patient, 32 years of age, who was considered normal in every way, was delivered without any trouble, after which 2 fibroids in the neighbourhood of the fundus became palpable through the lax anterior abdominal wall. These did not cause any symptoms until about 10 hours after delivery, when the patient experienced fairly severe abdominal pain and had a slight rise in temperature up to 100°F. The tumours were found to have increased in size and one of them was definitely tender to the touch. The symptoms subsided somewhat after 24 hours, but did not disappear. On the fourth day of the puerperium myomectomy was performed. Two of the tumours were subperitoneal, and the third, which was from the posterior surface of the uterus, was interstitial. They showed varying degrees of degeneration, but the interstitial fibroid was the most involved.

Eisaman[5] states that "the contractions of the uterus in the puerperium tend to evolve the tumour in the line of least resistance, thus freeing it from its bed and interrupting its arterial and venous channels." It may well be that part at least of the apparent enlargement felt in the case just described was due to the fact that the two tumours were being evolved from their bed.

Submucous tumours invariably become infected during the puerperium by the organisms normally present in the uterus at this time, and, of course, the infection causes further degenerative processes.

The involution which takes place in the normal uterus during the puerperium also effects fibroids, inasmuch as they are under the same hormonic influence, but in many cases they involute to a smaller size than they were before pregnancy commenced. This is because the necrosed tissue in the centre of the fibroid may be wholly or partly absorbed.

CASE 3. The patient, a multipara, 32 years of age, was found to have a hard, round swelling on the anterior wall of her uterus which was diagnosed as a subperitoneal fibroid. Treatment was not considered necessary. Eighteen months later the patient presented herself for treatment for varicose veins. In the meantime she had gone through another pregnancy. The opportunity was taken to examine her fibroid, and it was found to be less than half its previous size.

It is well known that fibroids may cause obstruction during labour, abnormal insertion of the placenta, uterine inertia and post-partum haemorrhage, as described in the collection of cases by Ashkar.[5] No purpose would be served by discussing such complications here.

SUMMARY.

(1) Fibroids hypertrophy during pregnancy in response to hormonic influence.

(2) Such hypertrophy frequently outstrips the blood-supply and degeneration results.

(3) Interstitial fibroids tend to be exteriorized by the contractions of the uterus during pregnancy and also by the thinning out of the uterus. This exteriorization is another factor which tends to interfere with the blood-supply and so to cause necrobiosis.

(4) The blood-tight uterus of the puerperium is responsible for further degenerative changes in fibroids, because of the reduced blood-supply to the tumours, and furthermore the

puerperal uterus grips interstitial and submucous fibroids, thereby accentuating the anaemic condition of the fibroids.

(5) Fibroids involute after pregnancy in the same way as normal uterine tissue, but they sometimes become smaller than they were before pregnancy because of the absorption of at least some of the necrosed tissue.

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The Surgical Treatment of Carcinoma Cervicis Uteri by the Radical Vaginal Method

BY

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IN 1931, while I was submitting 5-year statistical end-results of carcinoma cervicis uteri treated with radiation therapy in the Third International Radiological Congress in Paris, I was much impressed to find the continental surgeons performing the radical vaginal operation in similar cases. On further inquiry, I found out that Adler[1, 2] of Vienna by combining this operation with post-operative radio-therapy had obtained much better end-results in cancer cases. With this initiative I started the vaginal radical operation and have tried to bring it to the present standard. After close study, work, and investigation for the last 8 years, it has been my experience that this operation should not be taken up light-heartedly; proper selection of cases is essential, and unless radium and deep X-rays are combined with the operation the latter will prove a failure. According to Stoeckel,[3] most of the surgeons, while professing to perform the radical operation, are satisfied with a simple hysterectomy, thus bringing discredit to this particular method of treatment. The radical operation demands minute dissection of the important structures of the pelvis, mobilization of the freely dissected ureter, radical removal of the parametrium and paravaginal tissue and the immediate introduction of radium into the parametrial region. Thus Heyman in a personal communication says: "Surgical interference requires great skill which must be acquired at the patients' expense." Greenhill,[4] in the "Year-book of Obstetrics and Gynaecology, 1936," states: "The extended vaginal hysterectomy for carcinoma of the cervix as performed by Halban and Adler of Vienna and by Stoeckel of Berlin, is much too formidable an operation for general use." This is indeed true

for those who operate only occasionally on patients with carcinoma of the cervix.

Greenhill further cites Fraenkel's reasons for advocating the operation: " (1) When such a severe malady as carcinoma can be removed in an hour he does not postpone its removal for a month. Such a delay may mean life or death to the patient, for one may be dealing with a tumour that is refractory to the X-rays, so that during this month it may become inoperable. (2) When one has two such excellent methods at one's command, namely radiation and operation, why should one choose one method when one can use both? The German position on this subject is that in operable cases, or those in which the operation is difficult, radiation should be used. On the other hand, in operable cases, or those which have become operable, the patient should be operated on and radiated before and after operation."

Plea for taking up the Radical Vaginal Operation.

(1) The end-results after Wertheim's radical abdominal operation and Schauta's radical vaginal operation are practically the same. (Schauta.[5])

(2) Radical removal of all the involved glands is possible only in occasional cases; because when the iliac glands, which may be removed, are involved, the aortic group of glands, which are not surgically approachable, are already carcinomatous. Some of the carcinomatous glands are bound to be overlooked because of their very small size. (Schauta.)

(3) The percentage of recurrence does not differ greatly after the two methods of operation, abdominal and vaginal.

(4) The extirpation of the lymphatic glands can contribute nothing towards the improvement of the end-results. (Wertheim.[6, 7])

(5) According to Doederlein: " It is certainly more important in improving the operation for carcinoma, to extend the excision so as to take away the parametrium and paravaginal tissue with the uterus than to place too much hope for betterment in the extirpation of glands."

(6) The greater part of the lymphatic vessels infiltrated in a cervical carcinoma run with the uterine veins in the transverse cardinal ligaments of Mackenrodt lying at the base of the broad ligament and extending from the uppermost part of the vagina and from the cervix to the lateral pelvic wall. When these lymphatic channels are infiltrated with carcinoma, cancer cells

FIG. 1.

Adrenalin and novocain solution injected in the left paravaginal tissue prior to Schuchardt incision.

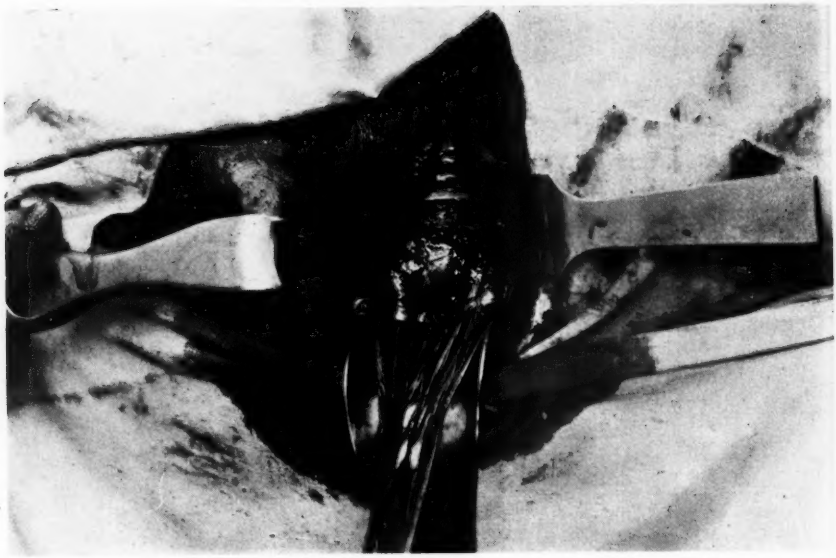

FIG. 2.

Vaginal Cuff completed: strands of crochet threads apposing the cut margins of vagina and paravaginal tissue to be used as tractors.

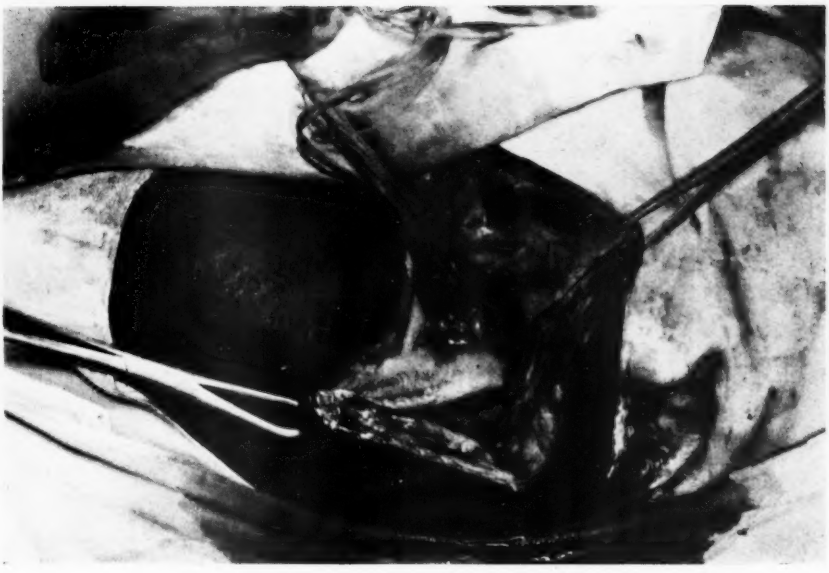

FIG. 3.

Schuchardt's left-sided paravaginal incision.

FIG. 4.

Bladder has been dissected and pushed up by the anterior speculum. On the left side bladder pillar can be seen as a prominence which on further dissection will expose the ureter.

FIG. 5.

The ureter has been very clearly dissected out and shown by the tip of the scissors slipping in between the ureter and the uterine vessels.

FIG. 6.

The uterus has been brought out through the utero-vesical opening and separated from appendages. With strong pairs of vulsellum pulling the fundus and tractors the cervix, the uterus is pulled to the right, thus stretching the left parametrium, which is being cut in one sweep with a pair of scissors.

are well isolated from the rest of the body by the connective tissue sheath of the ligament. The spread of carcinoma is slow in this location because of the marked *tissue pressure*. Once the cancer cells pass beyond the connective tissue bundle of Mackenrodt, they extend into loose subserous connective tissue: the prospects are no longer good, even if the lesion may be found operable from the technical point of view. But fortunately cancer cells remain shut up in Mackenrodt's ligaments for a considerable time and then spread slowly. This slow permeation is the reason why cervical cancer is a relatively favourable type of tumour for operation.

(7) The logical conclusion naturally follows that in operations for cervical carcinoma, the most radical possible excision of the parametrium and paravaginal tissue should be made including also a wide cup of vagina.

(8) The abdominal route was preferred originally because great hopes were placed in the removal of the glands: the excision of parametric tissue was never considered as important as the removal of lymphatic glands.

(9) The surgeon, expert in vaginal technique and thoroughly conversant with the surgical anatomy of the pelvis, can remove a greater amount of parametrial, paravaginal, paravesical and pararectal connective tissue by the vaginal route with Schauchardt's incision than by the abdominal route.

(10) The primary mortality is much less after the vaginal operation than after the abdominal operation, the ratio being, 7.7 per cent: 18 per cent. (Pankow.)

(11) Lastly, and which is supposed to be most important in cancer surgery, the radical vaginal operation facilitates the introduction of radium in the parametrial tissue immediately after operation. Post-operative radio-therapy consisting of radium and deep X-ray exposures has to be prescribed in every case, and continued at frequent intervals up to one year in order to get a permanent good result. Adler of Vienna has been able to bring forth the best end-results by following this technique.

Technique.

The carcinomatous growth is curetted and cauterized with surgical diathermy or ordinary red-hot cautery. Adrenalin (0.5 cubic centimetres) with normal saline (70 to 100 cubic centimetres) is next injected to the left side of the perineum near the site of Schuchardt's incision. It takes 20 minutes for proper

action of adrenalin, thus avoiding unnecessary bleeding and too many stitches.

Vaginal Cuff.

Schauta started making the vaginal cuff first and then the Schuchardt incision, but Peham's school does just the reverse. Peham believes that the vaginal cuff is not an absolute guarantee against bacterial invasion or implantation of cancer cells from the original growth to the neighbouring structures; on the other hand, without the previous perineal incision, it is a difficult and a time-consuming procedure to make a vaginal cuff, especially in the case of a narrow vagina. I make the vaginal cuff first when the vaginal outlet is very relaxed and the pelvis is one of gynaecoid type, because by the time the cuff is made, adrenalin already injected in the perineal tissue will have its full effect. But if the vagina is narrow or the pelvis is one of anthropoid or android type, or if the growth is still a big one after cauterization, I make Schuchardt's incision first. The making of the vaginal cuff is one of the most important steps of the operation. It is meant not only to cover the growth of the cervix but to excise along with it quite a large amount of vagina and paravaginal connective tissue proportionate to the extent of the growth. The disadvantage is that the vagina becomes very small in some cases and inconveniences marital life, but recurrence of growth mostly occurs in the vaginal scar if sufficient vagina is not removed.

The vaginal mucous membrane over the portio is clamped by 4 or 5 Kocher's forceps and a deep circular incision is made, which incises not only the vaginal mucous membrane but also the paravaginal connective tissue layer, i.e. the vesico-vaginal septum anteriorly and the recto-vaginal septum posteriorly. This paravaginal connective tissue layer is as important in cancer surgery as is parametrium, and should be removed *en masse* with the uterus and parametrial tissues. When one cuts through the vaginal and paravaginal tissue under tension, there is a sensation of relaxation in the deeper structures when the vaginal fascia has been completely cut through. Free dissection is made all round, thereby stripping the vagina with its fascia from the bladder and rectum and the flaps apposed over the growth with crochet cotton threads which are kept long and utilized as tractors.

Schuchardt Incision or Vagino-perineo-levatro Incision (Peham[8]*).*

It is generally made on the left side, although Stoeckel prefers

double-sided incisions. The difficulty with the double-sided incisions is with the healing up of the wound. It is better not to make the incision in one sweep.

Perineal Portion.

The perineal portion is commenced by cutting through skin, subcutaneous fat, central tendinous body, i.e. the junction of the vaginal constrictors, superficial transverse perineal muscles, the outward radiation of the sphincter ani and the urogenital diaphragm leading into ischio-rectal fossa; the *vaginal* incision is made through the left postero-lateral part thus exposing the levator ani muscle which should be cut in different layers. When the incision is properly made and a broad speculum inserted posteriorly, the approach to the internal genital organs with their attachments will be quite easy.

Free Dissection of Rectum and Bladder.

The rectum is first dissected off by pulling the tractor thread of the vaginal cuff towards the symphysis pubis, thereby making the recto-vaginal septum taut. The dissection of the recto-vaginal septum can be further facilitated by a lateral vaginal speculum. The bladder is then dissected off the anterior aspect of the uterus till the glistening surface of peritoneum is visible. Generally this dissection is quite easy, but the difficulty arises as a result of any prior operation-scar or too much scar tissue formation resulting from previous radium treatment, or due to marked infiltration of the base of the bladder extending from the cervix. Sometimes difficulties can be overcome by trying to free the bladder from the side instead of in the middle line. The bladder should be mobilized freely, not only in the middle line but also from the sides, and pushed beyond the utero-vesical ligaments. If the bladder is not separated from the side there will be difficulty in finding the ureter.

When the bladder has been freely dissected up to the utero-vesical pouch, it is pushed up with the help of an anterior speculum, thus making the pillars of the bladder taut and distinctly visible.

Thus when the vesical pillar and utero-vesical ligaments have been clearly exposed, the important stage of the operation, viz. the dissection of the uterine artery and ureter, begins. The ureter should be dissected freely and displaced laterally and upwards in order to make possible the removal of the maximal amount of the

parametrial tissue. The dissection should be made by small, steady and careful cuts with a pair of scissors and not merely pushed laterally without making any clear-cut demonstration of its topographical anatomy. By simply pushing the ureter laterally with a piece of gauze the bend of ureter (ureter-knee) is simply displaced in the deeper tissues. Thus one can never be sure whether the ureter has been right away from the field of operation or not, and there is every likelihood of its being injured during a further stage of the operation.

It is better to start dissecting the left ureter first because of the left-sided Schuchardt's incision. The relations between the uterus, uterine artery, and ureter will be better demonstrated by introducing broad posterior and lateral specula and by pulling the cervix downward and to the right side by means of the tractor thread bundle. Next, one starts cutting slowly through the vesical pillar and utero-vesical ligament by small nicks of a pair of scissors. The fibres of utero-vesical ligament cannot be distinctly separated from the vesical pillar. Occasionally the inferior vesical artery and vein may be cut during the process of dissection and should be ligatured.

After the vesical pillar has been further dissected up and laterally, the uterine vessels will be found near the junction of the cervix with the body of the uterus. As the uterine bundles are dissected and followed up laterally up to 1 to 2 centimetres the deeper part of the ureter and its bend will be visible. The ureter, during its course through the parametrium, is crossed by the uterine artery as it comes from the upper part of the pelvis; it then forms its bend and goes up to enter the bladder. This bend becomes more acute by pulling the uterus down.

When there is infiltration of the parametrial tissue the ureter is drawn closer to the uterus, and becomes adherent to its lateral aspect and thus is apt to be injured even before the uterine bundle is made properly visible. It would be advisable for the beginner to cut through only those tissues which can be distinctly differentiated, and as soon as the thicker strand of tissue is found extending from above downwards care must be taken of the ureter and an endeavour made to separate it from the uterine bundle, which courses rather transversely, by means of a closed pair of scissors. It is dangerous to make a blunt dissection with gauze, because if so, uterine bundles may be partly torn and the topographic representation will be altered. The ureter thus freed will appear as a typical whitish structure sometimes showing

peristaltic contraction. The further dissection of the ureter and its separation from the uterine bundle will not be difficult. Sometimes, in an advanced case, it will be necessary to open the canal of the uterine artery and laterally to displace the ureter, thus facilitating the removal of the greater amount of the parametrium. Such cases, according to Stoeckel, are serious, but the ureters are very easily detected on account of being fixed to the side of the uterus. In more simple cases, in which the ureter is very mobile and the bend does not become prominent after pulling the uterine bundle, the ureter moves so far out of the field with the mobilization of the bladder that it is very difficult to demonstrate, and is specially so if the separation is made by blunt dissection. The surgeon should not be satisfied that the ureter has been totally pushed away out of the field, but try to isolate it fully from the deeper parametrial tissues.

The uterine bundle is clamped above to the ureter on both sides, cut and ligatured, care being taken not to injure the ureter with the needle. Often there is a vein running under the ureter which should be separately ligatured. Some difficulties may also arise from a thickened wall of the uterine artery, either from arterio-sclerosis or from the action of radium, so that the vessel wall breaks through the pressure of the clamp, and if it is too near the ureter it will be difficult to ligature it. The best thing would be, if not possible to ligature the vessel, to use a tamponade and proceed to remove the uterus first. Lastly, when there is more space, the uterine vessel can be found spurting and ligatured. If the uterine vessels are found too close to the ureter, the latter may be displaced medially and vessels ligatured laterally; a similar procedure is also followed in the right side.

The Radical Removal of the Parametrial Connective Tissue is the Important Step of the Operation.

Extensive dissection and the steps of the operation so far followed are meant only to facilitate the radical removal of pelvic connective tissue. By opening the utero-vesical pouch the ureter is brought forward and separated from the appendages by clamping, cutting and ligaturing. The adnexa are not removed unless diseased, as in a case of ordinary vaginal hysterectomy. Next the pouch of Douglas is opened and the uterus now remains attached by the parametrial and paravaginal tissue, as well as by the utero-sacral ligaments. First the rectum should be definitely separated from the utero-sacral ligaments. To make

the operation radical, it would be better to pull down the fundus by a strong pair of vulsellum forceps and the cervix by means of the traction thread on the right side, thus making the whole of the left parametrial tissue quite taut, and then to divide with a pair of sharp scissors in one sweep as far laterally as possible, avoiding the rectum below and the ureter above. There might be a spurting middle haemorrhoidal artery or its branch which is easily ligatured. The peritoneal opening should be completely closed by passing a purse string suture through the peritoneum of the bladder and the stump of adnexa as well as through the peritoneum of the rectum.

Before the vaginal perineal wound made by Schuchardt's incision is stitched up, the whole area of the field of operation should be closely inspected to ascertain if there is any bleeding point. Occasionally bleeding occurs from a vesical vein in one of the vesical pillars, which should be ligatured.

The vesical sphincter and the base of the bladder are next raised up by passing across two or three Lembert stitches from one side to the other, thus forming a support for the bladder.

Lastly, radium tubes are inserted into both parametrial regions, and the dead spaces are packed with iodoform gauze and kept *in situ* for 24 hours.

Pre-operative and Post-operative Radiation.

Post-operative radiation treatment is given to every case operated upon, although Stoeckel and his school prefer operating on cases 6 weeks after radiation. I have always given post-operative radiation, with the exception of two cases. One was a recurrence of growth after radium treatment and the second case in which an operation had previously been attempted and then referred to me. After giving the patient a course of radium treatment, I performed a radical vaginal extirpation 6 weeks later. Adler lays much emphasis on post-operative radiation; his outstandingly good results are due to his systematic post-operative radiation, a detailed account of which is given below in his own words from a personal communication: " As a routine 50 mg. of radium element in $1\frac{1}{2}$ mm. brass filter is used in each parametrium for 6 to 10 hours. In cases in which the utero-sacral ligaments are involved a third or a fourth radium tube is used in the corresponding place. Thus the total amount of radium immediately applied is between 600 and 1,200 mgh. Eight weeks

after the operation I insert 30 mg. element in the vagina and 30 mg. in the rectum at a distance from the rectal walls of $2\frac{1}{2}$ cm. for 3 hours. This treatment is repeated in 8 weekly intervals six times.

The X-ray treatment is as follows:

Post-operative X-ray treatment.

First series—about 14 days after the operation:

(A) On thin patients: Ventral and dorsal 4 × 200 r. one large field. 50 centimetres focus—skin distance. Doses in the depth about 800 r. each series.

(B) On stout patients: 5 × 200 r. in some cases + lateral; in some cases + vulva: field 500 r. Doses in the depth approximate 700—1000 r.

Second series after 2 months. Third series after 6 months. Eventually a smaller dosage."

Analysis of Cases.

I have operated upon 82 patients, of whom 77 were in the Seva-Sadan Women's Hospital. Four of the cases were of grade I, 46 cases of grade II, and 32 cases of grade III.

Four patients died, the primary mortality being 4.87 per cent; 2 patients died of shock, one of pulmonary embolism on the 14th day, and one of pneumonia.

The bladder was injured in 3 patients, of whom one required a second operation and recovered perfectly. In one case the ureteric wall was so much thinned during dissection that it was almost on the point of bursting, but by careful stitching of the outer coat nothing untoward happened. In 2 cases there was injury to the rectal wall, due to Schuchardt's incision, but it healed spontaneously. In 10 per cent of the patients the perineal incision did not unite by first intention but later on healed by granulation. B. coli infection is a common factor during the post-operative period to the extent of about 54 per cent. In 4 of my cases pyometra was present.

It is too early to give any 5-year end-results, but the interim report is satisfactory.

Conclusion.

Although much has been done about cancer, the last word has not yet been said. My object is to record certain salient features of a method which has good prospect in the campaign against cancer.

With an open mind I started the surgical treatment with a

view to improving the end-results. At the beginning I began to get early recurrences, and I should like to quote Adler's opinion about such recurrences before I conclude: " You mention that you are getting recurrences earlier in your operation cases than in cases treated entirely with radiotherapy. If the operated cases are not properly radiated after operation, I quite understand it, because I had the same experience."

Thus, in order to obtain satisfactory end-results the whole question crystallizes into a proper selection of cases, a complete radical operation and the proper and systematic post-operative irradiation up to one year.

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A Case of Subacute Puerperal Inversion Treated by Aveling's Repositor

BY

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MRS. V.R.K., 2-para, was delivered of a male child at term at 9.45 p.m. on the evening of December 26th, 1937. The birth, which was easy and spontaneous, was immediately followed by a profuse haemorrhage. The medical attendant thereupon expelled the placenta and membranes and administered 1 c.c. of pituitrin hypodermically. This failing to alleviate the uterine haemorrhage, he was obliged to compress the uterus by the bimanual method while a hot douche was being prepared. After a hot uterine douche had been given the bleeding ceased, but since the condition of the patient was not deemed satisfactory she was sent and admitted to Fulham Hospital at 11.15 p.m. on the same evening.

After admission the patient was found to be cold, restless and shocked. A half-litre of gum-saline was administered intravenously and this was followed by 600 c.c. of citrated blood from her husband. She was now much better. During the next day she remained well. The pulse-rate dropped to 100 and the lochia were not profuse. During the following day, however, she began to complain bitterly of after-pains and the pulse-rate began to rise. Copious red lochia appeared and by the evening her general condition was again poor. The fundus appeared to be at a normal level, but the abdominal parietes were exceedingly tender following the uterine kneading and some distension was also present, thus rendering accurate abdominal palpation difficult. During December 29th after-pains were so severe that morphia was required in liberal dosage to alleviate them. The loss of blood was still free. A further transfusion of 500 c.c. of citrated blood from a Red Cross donor was given.

On the morning of December 30th I was asked to see this patient. Separation of the labia majora immediately revealed the rough, plum-coloured swelling of an inverted fundus uteri. It was found that the inversion was not quite complete and a soft, patulous cervix was felt high up and a finger passed through the external os was able to reach about 1 inch before meeting the inverting uterine wall. As there was considerable bleeding after the examination it was decided to transfuse the patient again before attempting to treat the condition, and a further 700 c.c. of blood were given. Dr. Coyle, the Superintendent of Fulham Hospital, undertook to provide an Aveling's repositor for me. At 8.30 p.m. on the same evening the patient was anaesthetized and again examined. The inversion could be easily replaced until the lower segment had been completely reduced. When the firm resistance of Bandl's ring was encountered further headway could not be made and only profuse bleeding was produced. A handsome model of Aveling's sigmoid repositor with a large bakelite cap was introduced and packed round with gauze wrung out in flavine and glycerol. The waist-band and elastic connexions were adjusted to give moderate pressure and the patient returned to bed. The following morning, at 10 a.m., I withdrew the packing and found the cup of the repositor inside the uterine cavity. I removed the apparatus and, inserting my finger through the os, felt that all the uterus had reverted except for a small portion at the fundus.

Following these manœuvres the patient had a rapid convalescence. The puerperium was mildly febrile, the lochia soon became white and the haemoglobin rapidly increased. She was discharged well from hospital a month later. I saw her again after 3 months and found a perfectly mobile anteverted uterus.

In 1886 J. M. Aveling[1] concluded a postgraduate lecture at the Chelsea Hospital for Women on the subject of inversion of the uterus treated by the repositor, with the words: "And I state my belief that the mutilation of a woman by removing her uterus will no longer be necessary in consequence of replacing this important organ when inverted." Although Aveling was, in this lecture, referring particularly to chronic inversion, his remarks apply with equal force to the acute or subacute forms.

My success with this instrument prompted me to enquire into its use in recent years in acute puerperal inversion. McK. McCullagh[2] reported its successful use in 29 cases with no mortality. I have analysed the majority of cases reported in the literature since 1928 and have found that it has not been used in one single

instance. In the cases which I have abstracted there have been 17 deaths in a total of 83 acute and subacute puerperal cases treated by all methods, a mortality of 20 per cent. Sixteen cases were treated by hysterectomy or amputation either vaginal or abdominal, with a mortality of 38 per cent. Huntington, Kellogg and others[3, 4] have reported 10 cases replaced by the abdominal method with no mortality.

My general impression from reading over these cases is the anxiety on the part of the obstetrician to return the uterus to its normal position as soon as possible. In the presence of severe bleeding this desire is most understandable. The inverted uterus, however, in most cases contracts and retracts sufficiently well to prevent any copious loss, although naturally there is an increase in the red lochia. It is thus seldom necessary to rush the patient to an operating theatre and to reduce the inversion at once. In dealing with an acute or subacute inversion, the first indication is to treat the shock which is commonly present by warmth and blood transfusions, repeated if necessary. After the patient has been treated by these means then there is time enough to undertake reposition. Miles Phillips,[5] writing on this subject, has made a plea that the inversion should be neglected until the patient has entirely recovered from her blood-loss and shock. He has also pointed out that the inverted uterus involutes well and indeed in some recorded cases has rectified itself spontaneously.

In the majority of cases manual vaginal reposition of the uterus is successful. By using the correct method of pushing on the highest part of the inverted uterus and not on the fundus, the organ will be replaced without much difficulty. If the uterus proves refractory after moderate pressure has been used, and fresh bleeding from the placental site commences, then the time has come to desist. I cannot believe that vaginal or abdominal hysterectomy is now indicated or justifiable in such patients, especially when a fatal issue is not to be expected when they are left alone. Nor can I believe that abdominal replacement should be the first line of treatment, in spite of the excellent results claimed for it. When manual reposition fails I would urge the obstetrician to try using Aveling's repositor. A very large cup should be used and should be kept in position by a generous packing of gauze wrung out in glycerine and flavine. The fundus can invariably be returned inside the vagina and there must be few patients in whom the repositor cannot be kept in place. Following its application the accoucheur must examine his patient

every few hours, so that he can remove the repositor as soon as the fundus has been returned to the uterine cavity.

My purpose in recording this case is to recall the use of this beneficient instrument to those who may regard it as an interesting, but faintly barbaric relic of the nineteenth century.

I wish to thank Sir Frederick Menzies, Chief Medical Officer, L.C.C., for permission to record this case, and to Dr. Coyle, Medical Superintendent of Fulham Hospital for his kind co-operation.

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A Simple Breast-Reliever Pad*

BY

HOWARD WILLCOX, M.B., B.S. (Durham).

A SURPRISINGLY simple attachment for use on the existing type of breast-pump has recently come to my notice. This device consists of a resilient sponge rubber ring so designed that it is readily sterilized and will hold firmly on to any breast-reliever.

On extensive clinical trial, both in my private practice and in a maternity ward, I have invariably found a marked addition to the comfort of the patient and a much more easily established suction. The value of the pad is perhaps most marked in inflammatory conditions, when use of the standard pump is always attended by discomfort and, more often than not, by considerable pain.

The irregularity of the breast in mastitis and the disturbance of the normal breast contour render the application of an unyielding substance painful and often inefficient. This difficulty is easily overcome when the pad is *in situ*, and a recovery of the condition is accelerated in the absence of external irritation and excessive pressure.

The bruising frequently accompanying the use of a breast-pump in normal cases, i.e. when exhaustion of the breast is necessary, because of poor nipples or a premature child, has been found to be completely absent when the pad is used.

Incidentally, in hospitals where breakages are a common occurrence, it has been found that the number of damaged breast-pumps has been frequently reduced because of the protection afforded to the glass end.

* This pad is made by Messrs J. G. Franklin & Sons Ltd., London, and is called the Simplic Breast-Reliever Pad.

Obituary

FRIEDRICH VOLTZ

PROFESSOR FRIEDRICH VOLTZ, the Konservator and Director of the Radiological Institute of the Münich Universitäts Frauenklinik, died suddenly and unexpectedly on October 16th, 1938, from heart failure due to advanced calcification of the coronary arteries.

By the death of Professor Voltz the Universitäts Frauenklinik is deprived of the services of a colleague whose gifts were unusually many-sided and whose services were extraordinarily valuable by reason of his clear-sightedness, his capacity for hard work, and his great powers and learning: his untimely end at a comparatively early age found him engaged in a multitude of important scientific tasks.

Professor Voltz was born in Nürnberg on January 1st, 1891. He came of a family well known for several generations for its artistic ability—in painting especially. After completing his studies in natural science he did scientific work for the Erlangen firm of Reiniger, Gebbert & Schall, before becoming scientific assistant in the laboratory for radiological research at the Erlangen Universitäts Frauenklinik. From April 1st, 1921, he had been on the staff of the Münich Universitäts Frauenklinik.

In clinics having a radiological department of the magnitude of that of the Münich Universitäts Frauenklinik the co-operation of a physicist is absolutely essential. Voltz showed what could be achieved by clinician and physicist working together. The problems connected with X-ray treatment and with therapy by electric waves are so many-sided and so complicated that it is almost impossible for one with purely medical training to master all the relevant and responsible problems which arise, especially with regard to dosage. The numerous valuable reports published by Voltz, working alone or in collaboration with members of the medical staff of the clinic, testify to the fruitfulness of the labours of the scientist whom death has now removed.

His unusual gifts for organization succeeded admirably in the development of the radiological department of the Universitäts Frauenklinik. In the recent reorganization of the X-ray section and the replanning of the radiotherapeutic arrangements Voltz drafted the plans from the broad outlines to the smallest details, directed the work of transformation, and played an important part in making the X-ray section an exemplary institution to which pilgrims came from near and far. The statistical working out of the huge X-ray clinical material, also, is essentially his work. The experimental bases necessary for many technical questions connected with irradiation were worked out by Voltz in a masterly fashion.

Voltz had also conducted extensive investigations in problems of medical biology. His aptitude for teaching was very conspicuous, and its results, as seen in the many courses of instruction which he gave, penetrated afar. Towards the end of his tragically interrupted career many important tasks were under his consideration. The noteworthy success of the Münich Exhibition "Strahlen und Heilkunde", in connexion with the 1938 Congress of German Radiologists, is largely to be ascribed to his talents. The models of the buildings, etc., were designed and carried out in detail by Voltz himself: the considerable artistic gifts in drawing and painting which he inherited from his ancestors were here of great service to him.

In addition to these many and varied talents his sense of humour, which came specially to expression in his friendly management of the clinic, will not be forgotten. He was a great nature-lover. To those who worked with him he was, with his open-hearted ways, an ideal comrade. We shall never forget him. His work will live after him.

H. EYMER.

The name of Friedrich Voltz is closely connected with the work of the Health Organization of the League of Nations in the statistical assessment of the results of radiotherapy in uterine cancer. In 1928 Voltz became a member of the first committee, the task of which was to do the preliminary work on classification and on the rules for recording of data. Voltz's ability and great experience, and the time and interest which he devoted to the Committee's work, made him a most valuable co-worker.

The programme of the Committee included a study of the radiotherapeutic department of the Doederlein Clinic in Münich, which the Committee visited in December 1928. Voltz's excellent presentation to the Committee of the organization of his department, and his clear conception of the problems involved contributed greatly to the successful start of the work. The memory of his enthusiasm and charming personality will long remain.

C.B.

BRITISH CONGRESS OF OBSTETRICS AND GYNAECOLOGY

THE Eleventh British Congress of Obstetrics and Gynaecology will be held on the 4th, 5th, and 6th of April 1939 at Edinburgh. The chief subject for discussion, "Pain in Labour and Methods of Alleviation", will be introduced by Professor Chassar Moir (Oxford) and Dr. John Sturrock (Edinburgh). The official guests of the Congress will be Professor Wagner (Berlin) and Dr. Samuel Meaker (Boston). The programme will include communications on Genital Hypoplasia, Dysmenorrhoea, Tubal Infection, Hyperemesis Gravidarum, Results of Pregnancy Toxaemia, Trichomonas Infection, Male Sterility, Habitual Abortion, and Myometrial Activity. A visit will be paid to the Department of Animal Genetics under the direction of Professor F. A. E. Crewe.

A demonstration of pathological specimens will be arranged. Those who desire to exhibit pathological material will kindly communicate with the Local Secretary of the Congress, Dr. Chalmers Fahmy, 7 Chester Street, Edinburgh, 3.

Hotels. Information with regard to hotel accommodation will be gladly supplied by the Secretary on application.

Report of the Forty-Sixth Meeting of the Gynaecological Visiting Society of Great Britain and Ireland

THE Forty-sixth Meeting of the Gynaecological Visiting Society took place at Birmingham on the 26th and 27th of October 1938. There was a large attendance of ordinary and honorary members. On the morning of Wednesday, the 26th of October, the Society visited the United Hospital (General Section), where they saw operations performed by two of their members Sir Beckwith Whitehouse and Mr. Alfred Danby. Later in the morning they visited the Dudley Road Municipal Hospital, where they were received by Mr. Wentworth Taylor, the resident obstetrician and gynaecologist. They were shown the new obstetrical unit, which embodies the most modern ideas. It consists of four sets of 18 lying-in beds, with a labour room and infants' nursery in each. There is also a very modern antenatal out-patient department.

Lunch was at the Edgbaston County Club by invitation of the Birmingham members. The building was formerly the home of Dr. Withering, the discoverer of digitalis.

From there they proceeded to the New Medical School and Hospital Centre, of which Birmingham is justly proud. The dissecting room in the Anatomy Department was particularly admired. A very interesting demonstration was given by Dr. Smout, preparations of the foetal vessels of the human placenta by the corrosion technique being of particular interest. Dr. Jacobi read a paper on "Growth-rate of Different Cell Types in Vitro". The hospital, which contains about 500 beds, was about to open within the next few days. Tea was provided by Sir Beckwith Whitehouse at his charming home. The Business Meeting of the Society followed immediately afterwards. The chief topic of discussion was the proposed visit of the Society to America in 1940. The Dinner took place that evening at the Queen's Hotel, the chief guest being Dr. Newsholme, Medical Officer of Health for Birmingham, and Professor Parsons, Professor of Paediatrics.

The following morning, the 27th of October, a visit was paid to the Women's Hospital, Sparkhill, where operations were performed by Mrs. Bertram Lloyd, Mr. Macmillan, and Mr. Barnie-Adshead. This hospital contains 120 beds and is entirely devoted

to gynaecological cases except 17 which are used for puerperal sepsis, the cost of maintenance of which is borne by the local authority. Some of the members visited the Taylor Memorial Home for cases of advanced malignant disease. Lunch followed at the Queen's Hotel, and in the afternoon most of the members departed. A few completed the programme by visiting the Lucy Baldwin Maternity Hospital, Stourport, where they were shown round by Dr. Macarthur, and the Mary Stevens Maternity Hospital, Stourbridge, where Dr. Meldon conducted them round. Those are both very well-equipped hospitals of about 20 beds in each. This ended a most agreeable and instructive meeting.

BOOK REVIEWS

"Midwifery," by TEN TEACHERS. Under the direction of CLIFFORD WHITE, F.R.C.S., F.C.O.G., etc. Edited by SIR COMYNS BERKELEY, CLIFFORD WHITE, and FRANK COOK. Sixth edition. Cr. 8vo, 676+xii pp. London: Edward Arnold & Co., 1938.

A REVIEWER of a previous edition of this work stated that it was just as impossible to have a palatable broth made by 10 cooks as a readable textbook written by 10 teachers. In this edition Clifford White is the first chef: he has organized his under-chefs in such a manner that the team spirit is very evident, and the result is a most digestible mixture of midwifery which will be thoroughly enjoyed by the epicurean obstetricians who take the trouble to sample its delicacies. With so many courses there are sure to be a few which will not agree with the digestion of some, and these will be specially reviewed while the excellence of the remainder will be scarcely recorded.

The work follows standard lines, commencing with anatomy and the foetus, and ending with operations.

Hyperemesis gravidarum is a very serious condition. Enough stress is not laid on the fact that if induction of abortion is left too late it is worse than useless as a treatment. Much has been written about Caesarean section in pre-eclampsia, and we hold that it is being performed far too often. We also feel that the ten teachers would not all agree on its usefulness. The subject of eclampsia is thoroughly discussed. The treatment in private houses with the help of flying squads is mentioned, but this should surely be condemned, for the disease is so serious that admission to hospital is a necessity. There is a curious omission on the subject of ectopic gestation, for while it is mentioned that the reader can consult a gynaecological textbook, the fact that operation is a necessity is entirely neglected. In the treatment of hydramnios the exact method of how to drain away the liquor amnii should be given in more detail. The obstetrician is advised to wear an efficient mask, but the exact type is not described. The reviewer holds that if a mask is worn at all it should have a layer of cellophane or brown paper interposed between the layers of gauze; otherwise the mask is useless.

Figure 77 must be left out in the next edition, for it is really dreadful, and although it says that towels have been omitted for the sake of clearness the picture of the gloved hand encircling the anus is, to say the least of it, distasteful to the eye.

The difficulty encountered by obstetricians outside Ireland in dealing with persistent occipito-posterior position is mentioned, and the other mal-presentations are described with great clarity. The subject of trial labour is dealt with shortly and sweetly. We believe that greater detail will be required by the inexperienced.

The one bad spot in the book is accidental haemorrhage, and it seems to

be the only subject on which the team got out of hand. We were of the opinion that Caesarean section and Caesarean hysterectomy for this dire complaint had nearly completely disappeared. Certainly, it is possible to prove that the treatment by other methods gives far better results. In addition, enough stress is not laid on the fact that vaginal plugging is scarcely ever necessary for this condition or for unavoidable haemorrhage.

The treatment of the infant, and the subject of obstetric operations, are well dealt with. All operations, with the exception of pubiotomy, are well described, but it is suggested that decapitation should be performed with a sharp hook. The method of using a blunt hook in combination with a pair of scissors is to be preferred. Chloroform is still the anaesthetic of choice. It was mentioned at the beginning of the review that we should deal chiefly with our adverse criticisms, but the point must be very carefully emphasized that "Midwifery" by Ten Teachers will be found more than useful in the library of the physician who practises obstetrics.

B.S.

"A Textbook of Gynaecology," by A. H. CURTIS, M.D. London: W. B. Saunders Co. Ltd. Price 30s.

THIS is a first-rate book that must recommend itself to all classes of gynaecologists, for it will appeal almost equally to the experienced and the student, especially one aspiring to the higher qualifications. It fulfils the criteria by which a book may be judged to be good; the style is lucid, the substance comprehensive, and the presentation clear. In volume the author has achieved a pleasant medium between the large reference book and the short textbook.

Fear need not be entertained that this welcome American textbook, which, having visited us in two editions already, is no stranger, contains anything that transgresses the standards of our orthodoxy. In fact, I can pay the author a left-handed compliment by saying that the book might well have been written by an English gynaecologist, so closely does it conform to the strictest and the best principles of our own teaching.

The first part of the book contains several chapters on the anatomy and physiology of the pelvic viscera. The anatomy embodies the results of the author's personal dissections, and in my opinion is the best exposition of the female pelvis yet; the physiology is right in step with the most modern advances and cites a bibliography that will serve as a signpost to anyone interested in this aspect of our speciality. Next follows a section on inflammatory diseases, and this contains some interesting chapters on the rarer venereal infections of the genitalia, some of which, to judge by the illustrations, are happily confined to the Negro race. Professor Curtis draws attention to the coincidence of syphilis and carcinoma cervicis, which he believes to be less of a rarity than has heretofore been recognized. Other good chapters are the one dealing with ovarian tumours, that on sterility, and those on prolapse. Here it is interesting to note that the trend of his teaching from the operative aspect is towards the Fothergill school of thought, while for procidentia with uterine symptoms he recommends Mayo's operation. In this the repair of the pelvic floor is carefully stressed and it is

rightly emphasized that hysterectomy alone is not a treatment for prolapse. But even here Professor Curtis preserves an open mind and admits that the question of vaginal hysterectomy in the treatment of procidentia has not yet reached a final conclusion. This fair-minded attitude is typical of the whole book, which consistently avoids dogmatic or purely personal expressions of opinion.

It is a pity that such an excellent book is just a little spoiled by the use of such words as gynatresia, which apparently means atresia of the genital canal, but actually means nothing at all and is not even Fourth Form Greek.

The illustrations are excellent and lavish, and where portraying steps in operative technique possess very useful legends that make abundantly clear the points which they are intended to show. The bibliography is extensive and provides a full guide to further reading. The type is just right for comfortable reading without being so large as to make the book cumbersome.

J.H.

"Gas and Air Analgesia," by R. J. MINNITT, D.A.; pp. viii + 84. Illustrated, price 3s. Messrs Baillière, Tindall and Cox.

THE Minnitt gas-air apparatus, or one of its modifications, has now taken a definite place in the relief of pain during labour. In this book Dr. R. J. Minnitt gives a brief survey of the history of the method, and a very clear account of the mechanics and of the use of the apparatus, which automatically delivers a 45 per cent mixture of gas and air, is self-administered by the patient, and cannot be further administered if consciousness is lost by the latter.

He emphasizes the fact, that, under the rules of the Central Midwives Board, midwives may give gas and air by the Minnitt or similar instrument, provided that they have received special instruction and that they have another person, such as a senior medical student, or a pupil midwife, with them at the time of the administration.

A short chapter on the contra-indications, of which there are but three, is included, and the book finishes with an analysis of results, which demonstrate the safety of the method, and its efficiency as an analgesic.

Dr. Minnitt also states that the giving of gas-air is best started towards the latter end of the first stage of labour, and that, while it acts as an analgesic, it does not set out to be a general anaesthetic: the latter may be used by a registered medical practitioner, at the end of the second stage, if necessary. In our experience of the method, we certainly endorse the view that the gas-air administration should be started towards the end of the first stage, in order to derive the benefits it confers to the full, and we are also of the opinion that a general anaesthetic is usually desirable towards the latter end of the second stage.

A short chapter on the application of the apparatus to non-obstetric cases, such as for minor surgery, is included, and is interesting as indicating an extension of the scope of the method.

The book is clearly written, and well set out, and should be read by

those doctors and midwives who intend to use such a gas-air machine in their obstetric practice.

Vivian Barnett.

"Annual Report on the Results of Radiotherapy in Cancer of the Uterine Cervix." Second volume: statements of results obtained in 1931 and previous years (collated in 1937). Series of League of Nations publications. III. "Health," 1938. Official No.: C.H. 1338. 94 pp.

THIS volume is the second of the series of annual reports on the results of radiotherapy in cancer of the uterine cervix issued by the League of Nations Health Committee. In the first report invitations were made to directors of clinics to send in their reports. The collaborators in the first report, together with three additional collaborators, Dr. W. P. Healy, of The Memorial Hospital, New York, Dr. George S. Ward, of the Women's Hospital, New York, and Dr. S. Laborde, of the Institut du Cancer, Paris, contribute statements to this volume.

In order to decrease the sources of error in the statistical assessment of the results of treatment the committee has devoted attention to the means of securing uniformity in the allocation of the stages of cervical cancer and to definitions of the four stages. An atlas has been prepared containing 38 diagrams of the various stages, and may be obtained from the Publications Department of the League of Nations, Geneva. The definitions of the four stages have been modified according to the experience gained in recent years, and aim at greater simplification and precision. Notes are given for the guidance of collaborators, and specimen tables for cases treated in 1931.

In the present report information is available concerning 6,570 patients suffering from carcinoma of the uterine cervix, of whom 5,672, or 86.3 per cent, were submitted to radiological treatment.

The following table gives the results obtained five years from the date of treatment.

TABLE

		per cent
Alive without recurrence	1491	26.3
Alive with recurrence, including those operated upon after failure of radiotherapy	102	1.8
Died of cancer	3901	68.8
Died of intercurrent disease	113	2.0
Lost sight of	65	1.1
	5672	100.0

The 5,672 patients treated were allocated to stages as follows:

		per cent
Stage I	607	10.7
Stage II	1626	28.7
Stage III	2417	42.6
Stage IV	1020	18.0
Unclassified	2	0.04
	5672	100.0

Results of treatment calculated for each of the four stages:

	Number of patients treated	Alive without recurrence	Relative cure rate per cent
Stage I	607	335	55.2
Stage II	1626	590	36.3
Stage III	2417	512	21.2
Stage IV	1020	54	5.3
Unclassified	2	0	0.0
Grand Total	5672	1491	26.3

The volume should be in the hands of all gynaecologists and radiotherapeutists who are concerned with the treatment of carcinoma of the cervix uteri, and the committee repeat its invitation for the collaboration of institutes and clinics throughout the world.

No reference is made in the report to the possibility of differences in the cure-rate of different clinics being related to the methods of treatment used in those clinics. The committee is more concerned at the present time with the elimination of other factors which are liable to vitiate the reliability of cure-rates stated numerically.

I.G.W.

"Haandbog for Jordemödre" (Handbook for Midwives), by Prof. E. HAUCH, Copenhagen. First Edition, September 1st, 1919; Second Edition, February 1938.

In a preface to the first edition the author states his reason for undertaking the work and his chief aims in carrying it out.

A standard textbook by Stadtfeldt, written in 1891, and revised by Leopold Meyer in 1903, was sold out. It was, therefore, necessary either to write a new edition or compile an entirely new book. Professor Hauch preferred to do the latter, including all that was in the old, describing modern methods of treatment, and adding information on anatomy, physiology, and hygiene, so that midwives might not require to refer to a separate book on these subjects (Torgerslev). Indeed he wishes his work to be a handbook for midwives rather than a textbook.

Paying tribute to their intelligence and zeal for knowledge, he hopes his work may stimulate them to extend that knowledge, and so guide them in their duties that they may be able to cope with accidents and emergencies, yet never go beyond their rules in failing to call in medical aid, because of ideas of self-sufficiency.

In a preface to the second edition, written in 1938, Professor Hauch refers to further developments and changes in the book in accordance with modern views.

The book is exceptionally clear in letterpress and most explicit in description and explanation of its excellent illustrations. There are in all 185

plates—some original, some taken from handbooks by such authors as De Lee of Chicago and Professor Bunner of Berlin.

The first part of the book deals with the anatomy of the female pelvis and the sex organs lying in it, the bones of the foetal head, and their relation to the maternal pelvic bones and outlets. Methods of measuring the pelvic diameters are well described and illustrated.

The second part gives signs, symptoms, and treatment of normal pregnancy, labour and delivery, and then describes illnesses which may be associated with pregnancy, such as syphilis or gonorrhoea, and complications which may arise during pregnancy or labour and which may require special treatment, surgical or otherwise. Sections on external examination during pregnancy, on the management of different presentations, on types of abortion, and on vesicular mole deserve special mention.

The third part relates to the care of the newly born child and to treatment of diseases which may occur immediately after birth or later. Methods of artificial respiration are given in the case of apparently dead children, the management of apparent deformities, and full instruction as to nourishment for all children, normal or feeble.

Throughout the book the information given is so definite and comprehensive that failure to realize Professor Hauch's aims would be an impossibility for any conscientious student.

J. H. F.

Review of Current Literature.

Director: FREDERICK ROQUES, M.A., M.D., M.Chir. (Cantab.), F.R.C.S., F.C.O.G.

THIS Review contains the lists of contents and abstracts of the more important articles from the following journals with which the "Journal of Obstetrics and Gynaecology of the British Empire" exchanges:—

British.—The Lancet; British Medical Journal.

Canadian.—The Canadian Medical Association Journal; Bulletin Médical de Quebec.

Australian.—Medical Journal of Australia; The Australian and New Zealand Journal of Surgery.

Indian.—The Calcutta Medical Journal.

American.—American Journal of Obstetrics and Gynecology; The Journal of the American Medical Association; Surgery, Gynecology and Obstetrics; American Journal of Diseases of Children.

French.—La Gynécologie; Gynécologie et Obstétrique; Bulletin de la Société d'Obstétrique et de Gynécologie de Paris.

Belgian.—Brûxelles Médical.

Italian.—Annali di Obstetrica e Ginecologia; Archivo di Obstetrica e Ginecologia; Revista Italiana di Ginecologia, Bologna.

German.—Archiv für Gynäkologie; Zeitschrift für Geburtshülfe und Gynäkologie; Zentralblatt für Gynäkologie; Monatsschrift für Geburtshülfe und Gynäkologie; Münchener Medizinische Wochenschrift; Monatsschrift für Krebsbekampfung.

Scandinavian.—Acta Obstetrica Scandinavica.

South American.—Boletin de la Sociedad Obstetrica y Ginecologia de Buenos Aires.

Japanese.—Japanese Journal of Obstetrics and Gynaecology.

The Review of Current Literature thus keeps the readers of the Journal in touch with current literature throughout the world. At the end of the year an Index of all the subjects contained in the articles of the above journals is printed. Arrangements are also made to include abstracts of important articles on border-line subjects, such as Physiology, Biology, and Biochemistry.

LIST OF ABSTRACTORS

London: J. BEATTIE, F.R.C.S.; A. C. BELL, F.R.C.S.; R. K. BOWES, F.R.C.S.; J. LYLE CAMERON, F.R.C.S.; ALBERT DAVIS, F.R.C.S.; F. H. FINLAISON, F.R.C.S.; B. GILBERT, F.R.C.S.; R. J. KELLAR, F.R.C.S.; R. LIGHTWOOD, F.R.C.P.; J. A. MOORE, F.R.C.S.; C. D. READ, F.R.C.S. (Edin.); F. ROQUES, F.R.C.S.; R. WINTERTON, F.R.C.S.

Felsted: W. E. CROWTHER, M.B.

Leeds: R. H. B. ADAMSON, M.D., AND B. JEAFFRESON, F.R.C.S.

Liverpool: M. DATNOW, F.R.C.S.; P. MALPAS, F.R.C.S.; T. N. A. JEFFCOATE, F.R.C.S.

Manchester: R. NEWTON, M.D.

Glasgow: JANE H. FILSHILL.

The Lancet.

Vol. ccxxxiv, No. 5983, April 30th, 1938.
*Action of testosterone propionate on the female. G. L. Foss.

Vol. ccxxxiv, No. 5985, May 14th, 1938.
*Cutaneous application of follicular hormone. B. Zondek.

Vol. ccxxxv, No. 5992, July 2nd, 1938.
Rupture of a Caesarean scar. H. Arthure.

Vol. ccxxxv, No. 5993, July 9th, 1938.
*The irritable bladder of chronic cervicitis. J. Young and A. Cunningham.

Vol. ccxxxv, No. 5994, July 16th, 1938.
*Post-partum necrosis of the anterior pituitary. H. L. Sheehan and R. Murdoch.

Vol. ccxxxv, No. 6006, October 8th, 1938.
*Radiotherapy of menopausal menorrhagia. T. F. Todd.

Vol. ccxxxv, No. 6010, November 5th, 1938.
*Sacrococcygeal tumour obstructing the birth-canal. Arthur Naylor.
*Granulocytopenia following the administration of sulphanilamide compounds. F. D. Johnston.

Action of Testosterone Propionate on the Female.

Several cases are described of menorrhagia and metrorrhagia treated by the exhibition of testosterone propionate. The exact mode of action of the hormone is problematical, but there is no doubt that when injected into females, both animal and human, it does counteract the natural follicular hormone. It probably acts by inhibiting the gonodotropic hormone of the pituitary, and has the effect of controlling pathological uterine haemorrhage. There is, however, the one danger of masculinization, as manifested in the considerable enlargement of the clitoris, voice change, and diminution in size of the breasts.

Cutaneous Application of Follicular Hormone.

The author has previously shown that oestrone is absorbed through the skin. In addition the local effect is greater than when the hormone is injected or given by mouth, and so local inunction is of value in the treatment of senile pruritus, menopausal acne, etc. It is apparently necessary to use the alcoholic tincture, and this is almost as effective clinically as injections, and is in addition easily applied by the patient herself. The method is of considerable value in supplying or replacing substitution therapy.

The Irritable Bladder of Chronic Cervicitis.

In his previous work Young has called attention to the coincidence of chronic cervicitis with pain in the iliac fossa and other symptoms. In this

paper he and his associate point out that in many of these cases there is a considerable amount of vesical irritability. This can be successfully treated by cervical drainage and alcoholic injection of the pelvic plexus, and several cases are described illustrating its effect.

POST-PARTUM NECROSIS OF THE ANTERIOR PITUITARY.

Sheehan has shown that massive necrosis of the anterior part of the pituitary body is fairly common in patients after obstetric shock or haemorrhage. When recovery takes place the gland is necessarily sclerosed and atrophic, with hypomenorrhoea or amenorrhoea, hypothermia, and other clinical manifestations as a consequence. An interesting point arising from this work is that definite improvement in the symptoms follows during pregnancy, and as specific therapy is unsatisfactory, it would appear that the rational treatment of these cases is to encourage subsequent pregnancy.

RADIOTHERAPY OF MENOPAUSAL MENORRHAGIA.

Todd believes that radiation is the treatment for the great majority of cases of menorrhagia occurring at the menopause. Contra-indications are chronic salpingitis, fibroids, chronic subinvolution, metropathia, etc. When the cervix is badly diseased vaginal hysterectomy is usually the best procedure. In all other cases, however, an artificial menopause is best procured by radium, as this has the advantage over X-rays of allowing of biopsy at the same time. Complications are unusual, a not uncommon one being haemorrhage due to telangiectasis of the endometrium. The dose used should not exceed 1,800 milligram-hours, with a minimal time of 36 hours; the overall diameter of the rubber container should be 1 centimetre. Radionecrosis may follow excessive dosage.

SACROCOCCYGEAL TUMOUR OBSTRUCTING THE BIRTH-CANAL.

The sacrococcygeal region is a common situation for tumours and cysts. Many of them lie behind the sacrum, and naturally do not affect parturition. The anteriorily situated ones, however, may do so, and they are by no means uncommon. They very rarely, however, complicate pregnancy, because if large enough to do so they are usually attended to in early life. When left, however, they may cause dystocia, and a case is described in which this would have occurred if accidental diagnosis had not been made during routine vaginal examination. In this case Caesarean section was performed and the tumour was successfully removed at a considerably later date.

GRANULOCYTOPENIA FOLLOWING THE ADMINISTRATION OF SULPHANILAMIDE COMPOUNDS.

Of the many toxic effects which may follow the administration of prontosil and allied compounds, granulocytopenia may be one of the most fatal. The author records one personal case and analyses 10 others published elsewhere. The premonitory signs and symptoms are raised pulse-rate and temperature, vomiting, and general malaise, followed by dysphagia due to infection, ulceration or gangrene of the pharynx. The white cell-count is very low, averaging from 450 to 3,000. The mortality rate is extremely high,

and to prevent the condition the author suggests frequent blood examination in patients under treatment with this group of drugs in whom the response is atypical. Routine white cell-counts are unnecessary, for even this measure may not be sufficient to prevent a fatal issue. On the other hand, it is almost equally dangerous to cease treatment at the first advent of toxic symptoms, and the diagnosis must be very certain before the patient is deprived of the benefits of the drug. The duration of the treatment rather than the total dosage is apparently the important factor in the production of blood changes.

Albert Davis.

British Medical Journal.

No. 4041, June 18th, 1938.

*A case of abdominal pregnancy. R. Reid.

*Uterine rupture following Caesarean section. E. E. B. Rickards.

No. 4045, July 16th, 1938.

Dysfunctional uterine bleeding treated with progestrone. T. N. Macgregor.

Parasitic foetus successfully removed by operation.

No. 4046, July 23rd, 1938.

Rupture of the uterus during pregnancy. J. Riddell and J. Scholefield.

No. 4048, August 6th, 1938.

*Three cases of *bacillus Welchii* infection following abortion. R. Y. Dawbarn and B. Williams.

No. 4049, August 13th, 1938.

*The prevention and control of puerperal sepsis including its medico-legal aspects. R. W. Johnstone.

Prevention and control of puerperal sepsis: bacteriological aspects. R. M. Fry.

The prevention and control of puerperal sepsis: administrative aspects. A. Massey.

Prevention of puerperal sepsis. Ethel Cassie.

No. 4053, September 10th, 1938.

*Interruption of early pregnancy by means of orally active oestrogens. A. S. Parkes and E. C. Dodds.

No. 4060, October 29th, 1938.

*The suppression of lactation of oral oestrogen therapy. G. L. Foss and P. Phillips.

A Case of Abdominal Pregnancy.

Although full-time extra-uterine gestation is by no means uncommon, it is interesting to note that in nearly all cases, though the symptoms were

characteristic on subsequent review, the diagnosis was very rarely made. In view of this the publication of each new case encountered is justified in the attention it draws to the possibility of the condition occurring in every-day practice. In Reid's case the patient gave a typical history of tubal abortion in early pregnancy, and the gestation sac was diagnosed as an ovarian cyst, operation being undertaken for this purpose.

Uterine Rupture following Caesarean Section.

The symptomatology of post-operative uterine rupture is so varied that no one description is adequate to cover all the cases. To elucidate this the author has divided the cases into five groups. In the first group rupture occurs through an old upper segment incision, the placenta being situated away from the uterine scar. In these cases rupture usually occurs during labour, and there is little or no haemorrhage. On examination the bag of membranes may sometimes be palpated per abdomen, and the majority of cases make a good recovery. In the second group the rupture occurs in the same position, and the placenta is situated immediately beneath the site. In this the rupture is gradual, and usually occurs towards the end of pregnancy. When labour begins there is considerable haemorrhage, with a resulting serious prognosis. In the third group rupture occurs following a previous lower segment operation. The rupture occurs during labour, and haemorrhage is due to laceration of the uterine artery. In the fourth group the rupture is through an upper segment incision, and the whole foetus in its membranes is expelled into the abdominal cavity leaving the placenta behind. In the fifth the same occurs, the placenta being also extruded.

It appears that about 4 per cent of the Caesarean section scars give way, and the author lays particular stress on the importance of very careful observation during subsequent normal labour in a patient who has previously been subjected to Caesarean section.

Three Cases of Bacillus Welchii Infection following Abortion.

Infection by the *bacillus Welchii* is apparently uncommon following abortion. All three cases were fatal, in two the infection being a fulminating one. The chief interest lies in the fact that in two of the cases the diagnosis was observed by the history of the self-administration of a large quantity of drugs taken to procure an abortion, and in both the original symptoms were those of such poisoning.

The Prevention and Control of Puerperal Sepsis, Including its Medico-Legal Aspects.

It is generally agreed that there are, broadly speaking, two types of infecting organism to be guarded against in the prevention of puerperal sepsis. They are first organisms in the skin of the vulva, on hands and clothes and unsterilized dressings, etc., and these are for the most part non-haemolytic streptococci, staphylococci, and coliform organisms. The second is the haemolytic streptococcus so often found in connexion with the upper air passages. The former bacteria attack the wounds left by surgical trauma, the latter often appears after a normal spontaneous delivery. It is practically never in the birth canal before labour, but is usually conveyed

by droplet or spray infection from the throat of one of the attendants. The importance of this latter statement is that the patient or her relatives may successfully claim damages for infection conveyed in this way. With regard to prevention, the value of antenatal care is stressed, particularly in the care of infected tonsils, teeth and cervix. A point not generally appreciated is the danger inherent in sexual intercourse in the latter months of pregnancy. Diet is also important, but probably too much emphasis has been laid on the provision of vitamins. These are, no doubt, highly necessary for patients on a low and inadequate diet, but the average case enjoying a reasonable mixed diet does not require the addition of supplementary vitamin preparations. Similar remarks also apply to iron and mineral salts in general. With regard to the place for delivery the author believes that providing the patient's own home is suitable and that no obstetric complication is to be expected, there is no objection to domiciliary delivery. Sentimental considerations, however, often lead to patients being delivered in unhealthy, unsuitable houses, and the importance of medical attention should be stressed in discussing this question with the patient.

It is well known that statistics favour domiciliary rather than hospital delivery, but it is obvious that this is due to the fact that complicated cases naturally gravitate to hospital and so render the comparison fallacious. Asepsis and the bacteriological control of infection which can be obtained in hospital, are obviously advantageous, and the author is, therefore, in favour of institutional midwifery except when the domiciliary conditions are exceptionally good. From the legal point of view a very high standard of asepsis and segregation of infected cases is demanded from all types of maternity institutions, and emphasis is laid on most careful attention to this provision. In this connexion maternity homes should be more frequently and more searchingly inspected. Infected cases should not be admitted unless a separate wing is provided. When they are thus segregated, these patients should be under the care of an obstetrician rather than of a fever specialist, and the same provision should apply to abortions.

The model delivery of a patient is after all the most important factor is the prevention of sepsis, and emphasis is laid upon the simplest methods of cleaning during labour. Concentration on excessive antisepsis is deplored, a combination of moderate asepsis and antisepsis being the most desirable. The wearing of adequate masks has proved to be an essential preventive measure, and attention is once again drawn to Colebrook's finding that in emergency, unsterilized hands and gloves can be rendered completely aseptic by rubbing more dettol or dettol cream into them until they are dry. The same preventative methods should be observed throughout the puerperium. Sulphanilamide preparations are now of proved value in treatment and prophylaxis.

INTERRUPTION OF EARLY PREGNANCY BY MEANS OF ORALLY ACTIVE OESTROGENS.

It is now well known that injection of oestrogenic extracts into rabbits immediately after mating interferes with the establishment of pregnancy. In mice the ova are prevented from passing down the tube, while larger doses cause abnormal acceleration of transit, the egg in both cases being

destroyed. The endometrial preparation of early pregnancy is also suppressed with consequent prevention of implantation of the ovum. All these changes have been produced by injection, and the work on which this paper is based has been done with oral administration of the new oestradiol, ethinyl oestradiol, and the new synthetic oestrogen, diethyl-stilboestrol, both of which are reported to be highly active when given by the mouth. It was found that small doses of the preparations will prevent implantation and may terminate established pregnancy, by causing suppression of the luteal phase of the cycle. It is suggested that these experimental conclusions should be applicable to women, for the factors governing the implantation of the fertile egg are fundamentally similar in women and the lower animals. Clinical experiments have so far been ineffective in this respect, but the intensive work at present being carried out in the production of oestrogenic substances may provide us with orally active preparations which may be effective in inhibiting or interrupting pregnancy.

THE SUPPRESSION OF LACTATION BY ORAL OESTROGEN THERAPY.

It is well known that the anterior pituitary is of primary importance in lactation, and that when it is injected it stimulates the mammary glands of many animals if they have been previously sensitized with oestrin. In women the growth of the breasts is due to hormone stimulation in pregnancy, oestrogen stimulating development of the ducts and progestin growth of the alveoli. At parturition the hormone level falls and the anterior pituitary comes into action, the lactogenic hormone stimulating milk formation. The application of this clinically has been somewhat unsatisfactory owing to the difficulty of isolating the specific hormone, but in the suppression of secretion the authors show that quite small doses of oestrin given by mouth are adequate. It is also well known that when oestrin has been used to induce labour, subsequent trouble with the breasts is very often avoided. The authors have found that 5,000 international units of oestrin given twice daily were adequate in suppressing lactation, and there is no doubt that this represents a very real advance in the treatment of a very troublesome complication.

Albert Davis.

The Journal of Physiology.

Vol. xciii, No. 2.

*The osmotic pressure of foetal and maternal sera in the sheep. E. F. McCarthy.

THE OSMOTIC PRESSURE OF FOETAL AND MATERNAL SERA IN THE SHEEP.

Measurements have been made of the colloidal osmotic pressure of foetal and maternal sera equilibrated with standard phosphate buffer. The foetal serum exerts a higher osmotic pressure than the maternal and has a higher albumin content. The pressure exceeds the value calculated from measurements of the osmotic pressures of purified albumins and globulins in horse sera.

Jocelyn Moore.

The Journal of Anatomy.

Vol. lxxii, Part 4, 1938.

Connexions of the posterior commissure.

Development and myelination in the human foetus and young infant. M. F. Lucas Keene.

*Innervation of the ovary, uterine tube, testis and epididymis. G. A. G. Mitchell.

INNERVATION OF THE OVARY, UTERINE TUBE, TESTIS AND EPIDIDYMIS.

The nerves of the ovary and uterine tube arise from the following sources: (*a*) A superior group from the intermesenteric nerves and from the renal plexus. (*b*) An intermediate group from the superior hypogastric plexus or from the hypogastric nerve. (*c*) An inferior group from the inferior hypogastric plexus. The sympathetic innervation to the ovary is mainly by the superior and middle ovarian nerves. The inferior ovarian nerves carry filaments to the tubes and uterus. The parasympathetic nerve supply for the uterus is derived from the pelvic splanchic nerves.

Jocelyn Moore.

The Biochemical Journal.

Vol. xxxiii, Part 6, 1938.

*Spectrographic examination of the mineral content of human and other milks. H. Dingle and J. H. Sheldon.

Vol. xxxiii, Part 7, 1938.

*Composition of the milk from the breasts of new-born infants. W. L. Davies and A. Moncrieff.

SPECTROGRAPHIC EXAMINATION OF THE MINERAL CONTENT OF HUMAN AND OTHER MILKS.

The following elements placed in the order of spectrographic prominence may be regarded as normal constituents of the human and commercial milk foods examined: Ca, Ma, Na, P, K, Rb, Li, Ba, Sr, Mn, Al, and Zn. Pb and B are normally present in both types of milk but occur in minute and variable amounts. The presence of Cu and Fe in milk is doubtful. Human and non-human milks are very similar so far as mineral content is concerned. Non-human milk, however, contains an excess of K.

COMPOSITION OF THE MILK FROM THE BREASTS OF NEW-BORN INFANTS.

The analysis of 5 samples of the secretions from the breasts of newly born infants from 8 to 14 days old are reported. The total solids which range from 7 to 12.5 per cent, consist mostly of protein and lactose. Compared with normal milk the secretions are very low in lactose but high in globulin and non-protein nitrogen. The secretions contain appreciable amounts of peroxidase and phosphatase.

Jocelyn Moore.

Journal of the Institute of Public Health and Hygiene

Vol i, No. 2.

*Diet in Pregnancy. Dame Louise McIlroy.

*Emotional adjustments in the health of adolescents. D. Shiels.

DIET IN PREGNANCY.

Nutrition in expectant women is of utmost importance, and diet deficiencies may be the cause of many cases of abortion, stillbirth, anaemia, haemorrhage and toxaemia. The necessity for the administration of vitamins and mineral salts is stressed. Small meals at frequent intervals are more easily assimilated than large infrequent ones. Routine weight recording during pregnancy is of value in giving a guide as to the state of nutrition. An excessive gain in weight usually means, over-nutrition, lack of exercise, or the development of oedema. It is often the earliest sign of toxaemia.

EMOTIONAL ADJUSTMENTS IN THE HEALTH OF ADOLESCENTS.

The emotional problems of adolescents with regard to health and physical fitness is discussed. Provision for education and guidance in emotional matters should form part in the scheme in the drive for fitness and health in young persons.

Jocelyn Moore.

Bulletin of the Johns Hopkins Hospital.

Vol. lxiii, No. 1, July 1938.

*Urinary changes due to sulphanilamide administration. M. B. Strauss and H. Southworth.

The experiments described were done to investigate the effect of sulphanilamide upon the urinary constituents and these results were found. In human subjects administration of this drug was accompanied by a decrease in the carbon dioxide combining capacity of the plasma, a diuresis, and an increase in the renal excretion of sodium and potassium. In dogs there was a slight loss of bone through renal secretion, but not enough to alter the carbon dioxide capacity of the plasma even though the dosage was greater per kilo of body-weight.

Jocelyn Moore.

The Canadian Medical Association Journal.

Vol. xxxix, No. 2, August 1938.

*The relation of pregnancy to biliary disease and the control of vomiting of pregnancy. J. McGowan, M.D., and J. O. Baker, M.D.

THE RELATION OF PREGNANCY TO BILIARY DISEASES AND THE CONTROL OF THE VOMITING OF PREGNANCY.

In the authors' opinion, vomiting of pregnancy may sometimes be due to a spasm of the second portion of the duodenum. This type of spasm

may be produced at will in normal human subjects by an injection of a sixth of a grain of morphine and may be promptly and completely relaxed by inhalation of amyl nitrite, and partial relaxation may be obtained by the sublingual administration of one-hundredth of a grain of glyceryl trinitrate or nitro-glycerine. It was also found that the injection of insulin subcutaneously was followed by relaxation of the duodenal spasm.

The authors have treated cases of intractable vomiting of pregnancy with glyceryl trinitrate with consistently good results, the vomiting usually ceasing by the end of three days' treatment. The largest dose of nitroglycerine was 12 tablets of one-hundredth of a grain in 24 hours without harmful results. Because of the subsequent fall in blood-pressure, patients were advised to lie down for 10 minutes after the administration of this drug.

Bismuth by mouth, together with X-ray examination, has in a series of cases, demonstrated the presence of a spasm of the second portion of the duodenum following an injection of morphine, and also a similar spasm associated with severe vomiting of pregnancy. Complete relaxation always followed inhalation of amyl nitrite.

The authors further discuss biliary colic and post-cholecystectomy colic. Both these conditions were found to be relieved by the administration of amyl nitrite or glyceryl trinitrate. They discuss in some detail the mechanism whereby biliary colic is produced, and the methods they employed for carrying out the investigations. They are of the opinion that a spasm of the second portion of the duodenum and of the lower end of the common bile duct is not only the cause of biliary colic, but may, by retarding the overflow of bile, lead to infection of the biliary passages and the subequent formation of stones. Their investigations, however, are still in progress.

Several X-ray photographs illustrating the text and with full legends are given and a full bibliography is also appended.

J. Lyle Cameron.

The American Journal of Obstetrics and Gynecology.

Vol. xxxiv, No. 5.

The story of prenatal care. F. J. Taussig.

*Sarcoma of the uterus. E. Novak and D. F. Anderson.

The clinical significance of endometrial hyperplasia. F. L. Payne.

Observations pertinent to gonadotropic therapy in gynaecology. R. A. Ross.

A study of the hormonal content of ovarian cyst fluids. F. L. Adair and Ruth M. Watts.

An efficient composite operation for uterine prolapse and associated pathology. E. H. Richardson.

Prolapse of the uterus-shifting trends in treatment. J. L. Baer, R. A. Reis, and R. M. Laemle.

An unusual obstetric injury causing detachment of bladder and urethra from the symphysis pubis and complete epispadias. G. L. Hunner.

*The biological and clinical import of vulvo-vaginal mycoses. H. C. Hesseltine.

Analgesia and anaesthesia and their bearing upon the problem of shortened labour. A. H. Bill.

*The conservative treatment of premature separation of the normally implanted placenta. F. C. Irving.
The aetiology of congenital malformations in the light of biological statistics. D. P. Murphy.
The continuous auscultation of the foetal heart by means of an amplifying stethoscope. H. B. Matthews.
Selected abstracts. Caesarean section.

Vol. xxxiv, No. 6.

*The prevention of eclampsia. K. de Snoo.
The stillbirth problem. P. F. Williams.
Bone changes in the foetus following the administration of dicalcium phosphate and viosterol to the pregnant mother. G. E. Finola, Ruth Trump, and M. Grimson.
A modification of the Le Fort operation for increasing its scope. J. R. Goodall and R. M. H. Power.
Pregnancy complicated by ovarian and parovarian tumours. K. M. Wilson.
*The theca, granulosa, lutein cell tumours of the human ovary and similar tumours of the mouse's ovary. H. F. Traut and J. S. Butterworth.
*Experience in the treatment of carcinoma of the fundus of the uterus, with 5-year end-results in 47 patients. L. C. Scheffey and W. J. Thudium.
The nitrogen balance of a young primipara. W. H. Seegers.
Photographic records of the cervix uteri. J. M. Bruner, L. E. Rosebrook, and G. W. Cushman.
Abdominal pregnancy near term, operation and hormonal studies of the blood and urine with the placenta left *in situ*. A. S. MacGregor.
Actinomycosis of the ovary. F. H. Falls.
Ovarian pregnancy. A. E. Kanter.
Intestinal obstruction complicated by pregnancy at term. R. A. Reis.
Aberrant suprarenal gland tissue in the broad ligament. J. A. Gough.
Erythroblastosis foetalis as a cause of infantile mortality. C. T. Javert.
Unilateral gonorrhoeal salpingitis in bicornute uterus. H. C. James.
An aid in the study of sterility. R. E. Krigbaum.
Society transactions.
Collective review. Menstruation and its disorders.

SARCOMA OF THE UTERUS.

In this long paper Novak and Anderson give us many interesting and instructive comments, gained from their experience of 59 cases of sarcoma.

Thirty-nine, or 66.1 per cent, were in myomata, 11 in the uterine wall, 5 had origin in the endometrium, and 4 arose from the cervix. They believe that it is probable that these malignant tumours cannot arise from the mature muscle fibres but from unripe or undifferentiated muscular elements. They found that the symptoms of sarcoma were most indefinite and that the diagnosis is usually made only after histological investigation. Abnormal bleeding was important when it occurred after the menopause and especially when the symptoms occurred from a uterus already the seat of myomatous growths. Rapid increase in size of fibroids, especially when associated with bleeding, must always be looked upon as a suspicious sign of sarcoma.

The authors classify them as those arising from the muscle or the connective tissue of the uterine wall, those arising in myomata, those arising in the mucous membrane, and those arising in the blood-vessel apparatus. But, however, they state that in the majority of cases it is not possible to say from what structure in the uterus does any given sarcoma arise because of its invasive tendencies. Consequently, they feel that the classification according to the type of cell in the tumour is probably more serviceable. Even then many cases arose when it was not possible to be certain of the class to which an individual case belonged. They give as an example, a spindle-cell variety in which many cells are cut transversely, giving the picture of a round-cell type. In such cases they recommend the suggestion of Meyer, that the course of the blood-vessels may serve as a valuable guide.

The commonest type was that arising in a myoma. The authors state that in the great majority of cases the sarcomatous degeneration can be recognized macroscopically. It occurs most frequently as an area in the centre of the fibroid which looks like raw pork or presents a brain-like pultaceous appearance. These areas are often broken down and may be mistaken for cystic degeneration; however, the sarcomatous degeneration is always much softer around the edge of the cavity. This variety gave the most favourable prognosis. The type was usually spindle cell or mixed cell and with few or no mitotic figures. The authors are of the opinion that a sarcoma of a relatively low grade of malignancy is more likely to be found developing in a myoma than developing in the uterine muscle or endometrium. The incidence in their series was 0.56 per cent in 6,981 myomata. They warn investigators against the mistake of diagnosing cellular myomata as sarcomata, a fact which probably accounted for the 10 per cent figure of earlier writers. They believe that the grape-like sarcoma of the cervix, which is most commonly seen in children, is teratomatous in origin as embryonic striped muscle and even cartilage may be found in them. They believe, also, that surgery is still the treatment of choice, mainly because diagnosis can seldom be made before removal. All fibroids should be microscoped for evidence of malignant degeneration.

THE BIOLOGICAL AND CLINICAL IMPORT OF VULVO-VAGINAL MYCOSES.

One of the complications of diabetis mellitus in adult females has been a condition called *diabetic vulvitis*. This is thought to be due to the glucose or irritating substances in the urine. Hesseltine is convinced that the vulvitis is due to an infection by monilia or an allied fungus, and believes that every diabetic patient should be examined from this point of view. In his reported series he obtained positive cultures of the fungus in 54 out of the 57 cases with vulvitis. Of the 3 negative cases, 1 patient was menstruating, 2 patients had used local medications before the test, and none of them came up again for another examination. In order to find out whether the vulvitis was due to the glucose in the urine, he washed out the vagina repeatedly with a 10 per cent aqueous solution of glucose. Nine cases free from vulvo-vaginal fungi were treated for an average of 10 days and in none of them did any vulval symptoms or signs develop. Five patients who were suffering from mild vaginal mycosis without symptoms were also treated and within 3 days severe symptoms occurred. Another series was treated by the insertion of

4 to 8 grammes of glucose into the vagina daily with similar findings, the fungus carriers developing symptoms within a few days. The author then comes to the conclusion that the glucose plays only a secondary part in the development of diabetic vulvitis, by inducing a favourable medium for the growth of the fungus. For treatment, he recommends painting the vagina 3 to 6 times a week with a 1 or 2 per cent aqueous gentian violet solution. Experimentally, he found that free iodine was very potent for destroying the fungus *in vitro*. If this form of treatment is tried, he recommends the liberation of iodine from a mixture of potassium iodide and potassium iodate. To keep the free iodine in solution, it is necessary to add 3 extra molecules of the iodide to the amount in the usual equation. This is diluted with kaolin and prescribed in gelatine capsules.

THE CONSERVATIVE TREATMENT OF PREMATURE SEPARATION OF THE NORMALLY IMPLANTED PLACENTA.

In this paper Irving has investigated the results of treatment of 353 cases of premature separation of the placenta. He has divided his cases into 2 groups, (*a*) those with mainly external haemorrhage, and (*b*) those in which the haemorrhage was mainly internal. There were 234 cases in the external haemorrhage group. Of these 170 were delivered normally. These cases included artificial rupture of the membranes, low forceps, and breech delivery. There was not any maternal mortality. Thirty-four patients had an operative pelvic delivery, with a mortality of 8.8 per cent. The net foetal mortality, after deduction of those babies dead *in utero* or under 4 pounds in weight, of these 204 vaginal deliveries was 7.5 per cent. Thirty patients were delivered by Caesarean section with a maternal mortality of 3.3 per cent and no net foetal mortality.

There were 119 cases of the internal haemorrhage group. Of these only 2 were of the completely concealed type. Thirty-four cases were treated conservatively, with 1 maternal death; this patient died undelivered of acute toxaemia. In all cases but one the uterus contracted down well and there was not any post-partum loss; the isolated case had to be controlled by packing. Sixteen patients had an operative pelvic delivery, with a death-rate of 18.7 per cent, and 69 patients were delivered by Caesarean section, with a mortality of 14.5 per cent. The net foetal mortality by conservative treatment was 42.8 per cent, by operative pelvic delivery 50 per cent, and by Caesarean section 20 per cent.

Irving discusses the advisability of performing Caesarean section in any case of accidental haemorrhage. In a series of cases of six other authors the average mortality was 20.5 per cent, and in this series under discussion the rate was 3.3 per cent in cases of external haemorrhage and 14.5 per cent in the group of internal haemorrhage. On the other hand the death-rate of those treated by conservative methods was about 10 times lower. He states that those who advocate Caesarean section say that it is then possible to remove the uterus at the same time; but this combined operation carries a mortality of over 40 per cent. Also, it is so seldom really necessary. Although the net foetal mortality is much lower by Caesarean section than by any other method, Irving is convinced that all cases should be treated by conservative means for the sake of the mother, unless the safety of the child is the primary consideration.

THE PREVENTION OF ECLAMPSIA.

In this paper de Snoo, of Utrecht, Holland, gives us evidence in support of his belief that eclampsia is due to an excess of chloride in the body. He begins by mentioning that the current idea is that eclampsia is due to the circulation of special noxious substances elaborated in the placenta, but stresses the fact that such a toxin has never yet been demonstrated. He does not believe in its existence, especially when one considers how rarely gestational disturbances occur in animals. His opinion is that eclampsia is due to the effects of civilization, i.e. to our custom of salting our food. He is doubtful how far hypertension is consequent on the consumption of common salt, but he thinks that the last cause of the defective functioning of the kidneys and liver, and also the eclamptic attack, is due to vasomotor cramp. During his investigation of cases of eclampsia he found that there was a certain mechanism in the occurrence of the attacks which he ascribes to the irritation of a centre in the brain which he calls the cramp-centre. He then points out that if this theory is correct the fits in any given case depend upon the excitability of this centre and the presence in the blood of special irritants. This explains why some cases of toxaemia do not, and never will, have eclampsia, and why eclampsia develops suddenly in some patients who previously were apparently healthy. In Utrecht, out of 2,400 cases admitted for toxaemia, only 54 developed eclampsia. Although the author is certain that eclampsia was prevented by treatment in a certain number of cases, he believes that this low figure proves that the great majority of patients would never have developed fits even without treatment. Therefore he maintains that toxaemia and eclampsia must be looked upon as separate entities and that the latter is only the result of explosion of the cramp-centre. He says that women who have a normal blood-pressure never get eclampsia and neither do women who have lived on a salt-free diet. Even a milk diet is often not good enough, as 5 out of 348 patients on a milk diet developed eclampsia whereas only 4 out of 2,000 patients on a salt-free diet had fits, and all these 4 patients were proven to have erred from the diet. He stresses the point that, even if the symptoms of toxaemia increase and the patient gets very ill, eclampsia will not develop on a salt-free diet.

Out of 20,000 registered births there were 27 puerperal deaths, but not one patient died of eclampsia. However, 21 of these 20,000 patients had eclampsia, of whom 9 were primigravidae and 12 were multiparae. Two patients developed fits before anything abnormal was discovered; 3 developed fits on the second day of treatment; 3 failed to return after having been given the diet; 11 did not adhere strictly to the diet; and in 2 cases the diet was not prescribed in spite of definite indications.

THE THECA, GRANULOSA, LUTEIN CELL TUMOURS OF THE HUMAN OVARY AND SIMILAR TUMOURS OF THE MOUSE'S OVARY.

This is an instructive paper on a most interesting subject. The authors give a short but concise account of the history, symptomatology, and histology of the different forms of these tumours as they occur in women. The true granulosa-cell tumour is by far the commonest, probably because it is more easily recognized, while the luteoma and the thecoma are very rare.

The oversecretion of oestrin by the theca, granulosa, and probably also by the lutein cell tumours produces a characteristic syndrome associated with hyperplasia of the endometrium, irregular bleeding, and gradual symmetrical hypertrophy of the uterine musculature. If these tumours occur after the menopause, and apparently the thecomata usually do so, then there is a recurrence of a more or less regular type of uterine bleeding, enlargement of the uterus, and cystic glandular hyperplasia of the endometrium in the majority of cases. The endocrine activity of these tumours is established when removal causes the former status of the patient to be re-established. Most of these tumours are benign. The luteomata are probably the most likely to be malignant, 3 out of the reported 12 cases were; 20 per cent of the granulosa-cell tumours were malignant; only 1 of the thecomata was malignant. The luteomata usually cause amenorrhoea and their effect on the endometrium is obscure; 1 case has been reported in which irregular bleeding was the result. Probably some luteinization takes place in all granulosa-cell tumours and in this unusual case this might have been predominant.

While discussing the histological aspects of these tumours, the authors stress the importance of realizing great variations. The thecomata tend to simulate fibromata of the ovary in size, shape, and consistence. The cut surface also bears out this resemblance, except that the white fibrous whorls of tissue may be streaked with yellowish areas. The granulosa-cell tumours may be smooth or lobulated and are frequently semi-solid or cystic. The cut surface is yellowish grey, often with haemorrhagic discoloration. The luteomata are more often solid, of small size, and of a homogeneous yellow colour. Microscopically the thecoma is a fibroma with islands of fusiform cells. The cells can only be distinguished from the ordinary ovarian stroma cells by the presence of intracellular fibrils. They also tend to stain with fat stains because of the appearance of cholesterol esters within the cells. The authors point out that there are two forms of thecoma, (a) that in which luteinization is taking place: these areas stand out distinctly from the connective-tissue background; and (*b*) that in which luteinization is not taking place: these areas are difficult to recognize and probably are completely missed by the average pathologist. Granulosa-cell tumours are more easy to recognize, but they also vary with their degree of differentiation and in the arrangement of their cells. The authors, throughout their paper, stress how any variety of granulosa-cell tumour and many of the thecomata may undergo luteinization.

While discussing the origin of these tumours the authors do not accept the current belief that they are derived from unused nests of partially differentiated cells named by Robert Meyer as *granulosaballen*. From their experiments of irradiation of the ovaries of mice, they believe that they are derived from the surviving granulosa cells of the fully differentiated adult ovary. In mice they found that the reaction of the cells of the ovary to radiation depended upon their degree of maturity and their degree of differentiation. In general, it may be said, that radiation produces degeneration of all ova, partial degeneration of granulosa cells, only slight effects on theca and lutein cells, and stimulative proliferation of the germinal epithelium and granulosa cells. They produced tumours in the ovary of sexually mature animals, which were identical, histologically, with the

tumours under discussion. All stages of granulosa proliferation were noted. In some the growth was rapid, forming a solid mass of cells similar in every way to the cylindromatous type of human tumour. In others a small rosette arrangement, with a central area of degeneration, was seen, resembling the folliculomatous type of human tumour. They also noted in these mouse tumours the gradual luteinization of the granulosa cells until a fully formed luteoma was produced.

In view of their work, the authors believe that it would be wise to limit the use of X-rays in woman for the purpose of abortion or sterilization.

EXPERIENCE IN THE TREATMENT OF CARCINOMA OF THE FUNDUS OF THE UTERUS, WITH FIVE-YEAR END-RESULTS IN 47 PATIENTS.

The authors here give a good account of an analysis of 68 consecutive cases of carcinoma of the uterine body. Fifty-five patients, or 80.9 per cent, were over 50 years of age and 25, or 36.7 per cent, were nulliparous. Fifty-two patients, or 76.5 per cent, had definitely passed the menopause when symptoms began, but of the remainder 6 were over 50 years of age and it is probable that the menopause was not recognized. Metrorrhagia and menorrhagia in the premenopausal cases and spotting or bleeding in the post-menopausal cases were the most important symptoms occurring in 95.6 per cent. Discharge and pain occurred each in about 47 per cent of cases, but the authors feel that these symptoms were probably due to other causes and were important only in causing the patient to seek advice. The diagnosis of cancer of the body of the uterus was correctly made in 88.2 per cent of cases. In 8 patients, or 11.8 per cent, carcinoma was not suspected; in 3 cases it was revealed by curettage; in 4 cases curettage was not performed, and so it was missed; and in 1 case the report on the curettings as innocent was incorrect. From this the authors stress the importance of diagnostic curettage in all cases and state that they are sure that its theoretical disadvantage is completely out-weighed by its advantages.

Fibroids were found to be associated with the cancer in 23.5 per cent of cases and in 13.2 per cent the cancer had extended beyond the confines of the uterus. Three patients had prolapse of varying degree, in 2 of whom it practically amounted to procidentia. After noting the extent of the disease, all cases were classified into low, 32.3 per cent; intermediate, 39.7 per cent; and high, 26.4 per cent, histological grades.

With regard to treatment, the cases were divided into 47 cases treated between 1921 and 1931 and 21 cases treated between 1931 and 1936. Of the first group, 28.3 per cent had surgical treatment, 39.1 per cent had radiation, and 32.6 per cent had combined surgical and radiation therapy. In the second group 71.4 per cent were irradiated, 28.5 per cent had combined surgery and irradiation, and in no case was surgery used alone. Only the 47 cases seen prior to 1931 were investigated as to the result of treatment; 31.9 per cent have survived, but 3 patients died of other causes more than 5 years after treatment. Three more patients died of cancer more than 5 years after treatment, and so, if these cases are also included, the 5-year salvage would reach 38 per cent. The 5-year survival was greatest, 46.6 per cent, in the low grade of malignancy, 27.7 per cent in the intermediate group, and worst, 16.6 per cent, in the high grade. Combined surgery and radiation

saved 60 per cent of the low-grade cases, while of the intermediate and high-grade cases radiation alone gave the best results. In conclusion, the authors state that each case must be treated entirely on its merits, but that they feel that, if possible, the combined therapy should be carried out. They advise hysterectomy 6 to 10 weeks after radiation, radium or radium and X-rays, and that radium alone should be used in those cases in which the grade of malignancy is high or if there is any contra-indication to surgery.

Bryan Jeaffreson.

Surgery, Gynecology and Obstetrics.

Vol. lxvii, No. 3. September 1938.

*Conization of the cervix. N. F. Miller and O. E. Todd.

*The aetiology of extra-uterine pregnancy. A. J. Osiakina-Rojdestvenskaia.

Vol. lxvii, No. 4, October 1938.

*Radical treatment of intractable pruritus ani. S. Manheim and L. J. Druckerman.

*Carcinoma of the major vestibular, or Bartholin's, gland. S. Rabson and L. H. Meeker.

Conization of the Cervix.

The technique of conization of the cervix is described by Miller and Todd, who believe it to be a safe, rapid and eminently satisfactory way of treating the more extensive benign lesions of the cervix in older women.

In general its use should be limited to women past child-bearing age, but even in this group it should not be looked on as a substitute for the less radical procedures in use for the treatment of simple cervicitis. In the author's clinic conization has replaced the Sturmdorf operation

Conization is a desirable, quick, and convenient method of treating the cervix prior to subtotal hysterectomy.

The Aetiology of Extra-uterine Pregnancy.

The aetiology of tubal pregnancy may depend on three factors (1) the ovum developing its capacity for implantation before time; (2) disturbed transportation of the ovum; and (3) mechanical obstacles encountered by the ovum of its journey.

All three factors are closely connected with one another and therefore their distinction of one from another can be only approximate. However, the outstanding cause is the second factor, for in all probability it may be the independent cause of tubal pregnancy, while the first and third in particular play merely a relative part, and must be accompanied by disturbed transportation, however slight, to cause tubal pregnancy.

The author has made a study of 100 cases of tubal pregnancy in Leningrad and believes that the cause of the implantation was the first factor, external migration of the ovum, in 10 per cent of cases; the second, disturbed transportation, in 16 per cent of cases; and the third, mechanical obstacles, in 76 per cent.

He believes that the improvement in living conditions, the less frequent occurrence of infectious diseases, and the better working conditions for growing girls, will reduce the percentage of extra-uterine pregnancies.

Radical Treatment of Intractable Pruritus Ani.

Manheim and Druckerman were recently confronted with three cases of severe intractable pruritus ani, and they decided to attempt complete excision of all the diseased tissues. The technique used is as follows: The sphincter is gently dilated. The entire affected area is circumscribed by a circular incision usually at a radial distance of two to three inches from the anal margin. The incision is carried down through the entire thickness of the skin until normal subcutaneous fat is encountered. The dissection is then continued in the subcutaneous tissue up to the mucocutaneous junction. In so doing the fibres of the corrugator cutis ani muscles are severed and the subcutaneous portion of the external sphincter muscle is carefully expressed and protected. The cone-shaped area of the skin is split anteriorly and posteriorly in order to facilitate the subsequent section at the mucocutaneous junction which is performed after clamps are placed on the mucous membrane to prevent retraction. The gluteal skin is mobilized for a distance of one to two inches. All bleeding points are carefully controlled. Four silk mattress sutures are placed between the mucous membrane and the skin edges at equidistant points anteriorly, posteriorly and laterally. Interrupted silk sutures are used to complete the approximation. A small piece of vaseline gauze is inserted into the newly constructed anal canal and the entire operative area covered with vaseline gauze.

The results were most gratifying. Pruritus disappeared immediately after operation. The average duration of stay in hospital was only 11 days. Complete healing occurred from 6 to 10 weeks after operation, and contrary to general belief this operation is not followed by severe post-operative pain, stricture or incontinence.

Carcinoma of the Major Vestibular, or Bartholin's, Gland.

Malignant disease of Bartholin's gland is rare and usually the diagnosis is made only at operation. Careful observation of the patient and timely surgical intervention together with laboratory examination of the excised material offers the only hope of recovery.

Fifty-six such cases have now been recorded or published, not including two cases described in this paper. In seven instances no information is given as to the type of carcinoma, two cases are described as anaplastic, one each as solid small cell and adenosquamous cell carcinoma. Adenocarcinomata numbered 29 and squamous cell carcinomata 12.

In most instances resection was performed. Radiation therapy, both X-rays and radium, was also used, usually after operation. Recurrence took place after a few months in most cases and a second recurrence was frequent.

C. D. Read.

American Journal of Diseases of Children.

Vol. liv, No. 1, July 1937.

*Infection of the renal parenchyma from the pelvis of the kidney. H. F. Helmholz.

*Fate of children infected with tuberculosis during the first five years of life. H. A. Rosenberg, J. Heights, and Camille Kereszturi.

*Immunization against scarlet fever. M. G. Peterman.

Vol. liv, No. 2, August 1937.

Sternal marrow puncture in infants and in children. K. Kato.

Utilization of organic and inorganic iron by the normal infant. Helen Oldham, F. W. Schlutz, and Minerva Morse.

Studies with B.C.G. IV. The focal and general tissue response and the humoral response; the intradermal route. S. R. Rosenthal.

Vol. liv, No. 3, September 1937.

*Infection of the lower part of the genital tract in girls. J. L. Reichert, Ruth Jung, and Charlotte A. Colwell.

Vol. liv, No. 4, October 1937.

The stabilizing effect of increased vitamin B (B_1) intake on growth and nutrition of infants: basic study. M. W. Poole, B. M. Hamil, T. B. Cooley, and Icie G. Macy.

The relation of increased vitamin B (B_1) intake to the mental and physical growth of infants. Preliminary report. Martha G. Colby, Icie G. Macy, M. W. Poole, B. M. Hamil, and T. B. Cooley.

Hypertrophic pulmonary osteo-arthropathy in infants and in children. R. L. J. Kennedy.

Vol. liv, No. 5, November 1937.

*Present status of preventive inoculation against whooping cough. L. Sauer.

Vol. liv, No. 6, December 1937.

*Pathogenesis of tetany of the newborn. H. Bakwin.

Infectious diarrhoea in the newborn caused by an unclassified species of salmonella. Beatrice McKinlay.

INFECTION OF THE RENAL PARENCHYMA FROM THE PELVIS OF THE KIDNEY.

This report reviews the work concerning the way in which infection is able to enter the renal parenchyma: (1) By ascent of the collecting tubules, producing local lesions in the papilla, medulla, or cortex. (2) By extension along the perivascular lymphatic spaces of the large vessels which enter the substance of the kidney. (3) By the vascular route, arterial or venous, by direct infection from the adjacent infected renal pelvis. (4) By direct extension through the wall of the renal pelvis into the renal parenchyma at any point where it lies in direct contact with the pelvis, frequently at the point where the pelvic lining is reflected from the renal parenchyma.

Of these pathways the perivascular lymphatic vessels are commonly held

to be the chief route. Histological studies in certain acute cases in children had caused Helmholz to be doubtful concerning the usual route of infection, and he, therefore, carried out experiments in rabbits, giving separate attention to the method of spread in cases with and without ureteral obstruction.

The nature and the results of his experiments are presented and illustrated photographically. The author's summary is as follows:

"With stasis, the parenchyma of the kidney rapidly becomes infected from the pelvis by way of the perivascular lymphatic structures and by direct passage of the organisms through the pelvic lining over the parenchyma. Thrombosis forms an important feature of the renal changes. Without stasis infection of the renal pelvis tends to remain local, and only exceptionally do changes occur in the parenchyma. The striking difference between the author's two series of experiments shows the importance of avoiding stasis at all costs in the treatment of ascending infection of the urinary tract."

The importance of maintaining a good drainage in all cases of infection of the urinary tract is emphasized. In the acute stages of infection the object of treatment is the production of a sufficient volume of urine to wash out thick purulent exudate and so prevent stasis.

FATE OF CHILDREN INFECTED WITH TUBERCULOSIS DURING THE FIRST FIVE YEARS OF LIFE.

Not many years ago tuberculous infection of infants was thought to be fatal as a rule, but since the more widespread application of tuberculin testing and Roentgen diagnosis, there is less pessimism concerning their fate though the prognosis for infants with clinical signs of the disease was, and still is, grave. Apparently healthy children whose only sign of tuberculosis is a positive reaction or abnormal Roentgen appearance, have been followed up and the prognosis has been shown to be much better among them.

During the investigation of B.C.G. vaccination of infants which was started in New York in 1926, 1,000 non-vaccinated infants exposed to tuberculosis by contact have been observed as controls. Of these 1,000 children, 348 were either tuberculin-positive when first seen, or became so afterwards. The fate of this group of 348 tuberculin-positive children is presented in this report.

Of these patients only a few were clinically ill, but 28.9 per cent had pulmonary parenchymal shadows. The difficulty of interpreting these abnormal shadows had already been pointed out by one of the authors. A large series of films was read by an expert radiologist who was not familiar with the clinical history of the patients or with their tuberculin sensitivity; one-third of the mediastinal and one-fifth of the parenchymal shadows described as abnormal occurred in apparently healthy children who had negative responses to the tuberculin test.*

The 348 patients of the series were observed from 1 to 9 years and their death-rate from tuberculosis was 9.1 per cent. The age of a child at the time of infection was the chief determining factor in prognosis. Of those infected during the first 3 months of life 43.7 per cent died; of

* See *Transactions of the National Tuberculosis Association*, 1935, xxxi, 97.

those infected in the first year 14.8 per cent died. No deaths occurred in those children infected after the age of 18 months. All the deaths took place before the children were 3 years old.

The extent of pulmonary involvement as estimated by radiological evidence was important in prognosis. The rate of deaths from tuberculosis was more than 5 times as high in children with parenchymal lesions as in those with enlarged tracheo-bronchial glands, and about 8 times as high as in those who did not give any radiological evidence of having tuberculosis.

The importance of the duration of exposure to the source of infection has been studied by others and reported upon by Debré, Lelong, and Bernard (*Presse Médical*, 1925, xxxiii, 345). They found that of 265 infants exposed to tuberculosis who were separated from the tuberculous source before they became infected, none died of tuberculosis. Among 171 patients who were separated from the source after they became infected but while they were in good condition and had no clinical disease, 7.6 per cent died of tuberculosis. Finally, of 66 patients who became infected and remained in the same environment, 82 per cent died in the course of 4 years during which they were observed.

Immunization Against Scarlet Fever.

The author reviews the position concerning active immunization against scarlet fever and summarizes as follows:

1. The bacteriologists and most clinicians do not accept a specific strain of the haemolytic streptococcus as the causative agent of scarlet fever.

2. The bacteriologists insist that it is not possible to produce an active immunity against any streptococcus.

3. The specificity of Dick's test has not been proved.

4. Active immunization with Dick's toxin or vaccine prevents the development of a rash for 2 or more years. If the inoculated person becomes infected with scarlet fever, his physician is robbed of his most valuable diagnostic sign.

5. In April 1935 the Special Committee on *Prophylactic Procedures Against Communicable Diseases of the American Academy of Paediatrics* reported, "Active immunization against scarlet fever . . . is not recommended as a general public health procedure, since reactions both local and general are frequent . . . and for the reason that the degree and duration of immunity have not been definitely established."

Infection of the Lower Part of the Genital Tract in Girls.

This communication records the joint investigations carried out by the Departments of Paediatrics, Bacteriology, and Social Service of the North-Western University Medical School, Chicago, into 121 cases of infection of the lower part of the genital tract in girls. The importance and commonness of the condition is emphasized. In this series 76.6 per cent of the cases were gonorrhoeal. The final differential diagnosis must be based on examination of both smears and cultures. In over half the gonorrhoeal cases the infection was contracted in the home, and in all but 1 of the cases the source of infection was an adult.

For treatment, a tragacanth jelly was used as a vehicle and protein silver, 2 per cent, was found to be the most effective germicide; by it

80 per cent of cases were apparently cured in 1.5 months. Mercurochrome, 2 per cent, was the least effective germicide to be given trial. Oestrin therapy shortened the time of apparent cure but there was a higher incidence of recurrence, so that in the final analysis the results were not improved by its use. As an adjunct to this treatment, theelin in oil is advocated because it is claimed that less oestrin is required when theelin is used as an adjuvant.

PRESENT STATUS OF PREVENTIVE INOCULATION AGAINST WHOOPING COUGH.

Two hundred thousand cases of whooping cough are reported annually in the United States and there is a death for every 39 of these reported cases, or 5,200 per year. As pertussis is fatal only during the first few years of life, preventive inoculation should be undertaken as early as active immunization is likely to result.

Sauer's vaccine is prepared from 5 to 7 freshly isolated haemolytic cultures of the bacillus. Human blood is used in making the culture medium. Other pertussis vaccines are discussed in the paper. The second half of the first year is probably the best time for preventive inoculation.

Inoculation with potent antigen confers protection on a high percentage of young children. Occasional failures doubtless occur in spite of flawless technique in the preparation, the preservation, and the administration of the vaccine because there are not any tests for the standardization of antigen in regard to its essential immunizing fraction. Humoral phenomena, such as agglutinin response and complement fixation reactions, are not criteria of tissue immunity. Exposure to the disease is the ultimate test of immunity.

PATHOGENESIS OF TETANY OF THE NEWBORN.

In 1913 Kehrer described a group of newborn infants with convulsions, flexor contractions of the extremities, carpal spasms, facial irritability, and the sign of Trousseau. Rapid improvement followed the administration of calcium salts. He believed the condition to be tetany of the newborn. During the last few years a large number of reports has appeared in American literature. The diagnosis is open to question unless the blood calcium has been determined (tetany without hypocalcaemia occurs as alkalosis tetany, oxalate tetany, and citrate tetany). The clinical features of tetany of the newborn are similar to those of tetany in older infants. Tetany may be latent, and suspected only by eliciting facial reaction, or accidentally by estimating the calcium content of the blood. Manifest tetany is shown by convulsions and twitchings; carpopedal spasm may be seen; laryngospasm is rare. The causation of this condition is then considered and it is suggested that 3 mechanisms may produce it, (1) deficiency of vitamin D; (2) underfunction of the parathyroids; (3) reactivity to phosphate, (*a*) endogenous, (*b*) high phosphate in cow's milk.

R. Lightwood.

Bruxelles Médical.

Vol. xviii, No. 36, July 10th, 1938.

Exclusion of the pelvis from the upper abdominal cavity. J. Rouffart-Marin.

Vol. xviii No. 37, July 17th, 1938.

*Quantitative estimation of gonadotropic hormones in urine. L. Deselin.

Vol. xviii, No. 39, July 31st, 1938.

Pathology and treatment of congenital dilatation of the urinary tract. C. Perrier.

*Three cases of obstetrical dystocia. G. Nolens.

Vol. xviii, No. 40, August 7th, 1938.

The treatment of recently acquired syphilis. G. Uribe-Escobar.

Vol. xviii, No. 41, August 14th, 1938.

*The sedimentation test in the differential diagnosis of acute salpingo-oöphoritis, acute appendicitis, and extra-uterine pregnancy. J. A. Rosman and H. Nolens.

Vol. xviii, No. 42, August 21st, 1938.

*Pudendal anaesthesia in obstetrics. Fr. Mercken.

Société Belge de Gynécologie et d'Obstétrique. Report of proceedings, July 2nd, 1938.

QUANTITATIVE ESTIMATION OF GONODOTROPIC HORMONES IN URINE.

Quantitative estimation of gonadotropic hormones is of importance, but is made difficult by the fact that such substances cannot be isolated in pure chemical form. The biological tests available are reviewed.

The author emphasizes the differences between gonadotropic hormones of pregnancy urine and those present in the urine of menopausal patients. The latter are similar to those of extracts of anterior pituitary gland. True anterior pituitary hormones produce ovarian enlargement which is proportional to the amount of hormone used. Gonadotropic hormones from pregnancy urine, however, produce only limited growth of the gonads, and cannot replace pituitary function in hypophysectomized animals.

In view of these differences, the results of estimating the amounts of these hormones in urine are not comparable. Moreover, with regard to gonadotropic hormone of pregnancy urine, the tests should be made on hypophysectomized animals. Further difficulties arise because results differ according to the species of test animal used and the technique adopted. Moreover, even in the same species there are wide variations in the responses of individual animals and at least 10 animals are required for each test. In this connexion the work of Hill and Parkes and Ruth Deanesley is reviewed.

Although quantitative estimation of gonadotropic hormones is difficult and far from accurate, it is already of some clinical value as in the diagnosis of hydatidiform mole. Nevertheless, with regard to quantitative work in general, the author counsels prudence in accepting the results.

THREE CASES OF OBSTETRICAL DYSTOCIA.

Case 1. The patient had previously had two children. When admitted to hospital after being in labour for two days, the uterus was contracting

very forcibly. Although the foetal head was low, a hard tumour was obstructing labour. Puncture of the tumour produced no reduction in its size. Lower segment Caesarean section resulted in the birth of a living child and the mother made a good recovery.

Subsequently a large degenerating fibroid was removed by the vaginal route.

Case 2. A multiparous woman of 37 was admitted at the thirty-second week of pregnancy. She was in a collapsed condition and bleeding vaginally. The clinical features suggested the diagnosis of spontaneous rupture of the uterus. After the intravenous administration of saline laparotomy under spinal anaesthesia confirmed the diagnosis, and hysterectomy was followed by recovery. The child was dead.

This patient's first five confinements had been normal, but the sixth was complicated by a breech presentation. Forcible traction on the breech before full dilatation of the cervix had resulted in extensive laceration so that loops of intestine prolapsed through the vaginal fornix. This previous injury was no doubt the cause of the subsequent rupture, although the site of rupture was in the anterior wall of the lower segment.

Case 3. A patient, aged 45, who had had 12 children, was suffering from concealed accidental haemorrhage and albuminuria. On admission the foetus was lying transversely and as the cervix was partly dilated internal podalic version was performed. Extraction of the child was easy, but was followed by profuse arterial bleeding and collapse of the patient. Suture of the cervix and tamponage failed to control the haemorrhage so that hysterectomy was performed. Blood-transfusion was necessary both before and after operation and the patient recovered.

In describing these cases Nolens points out the advances in obstetrics which have taken place in recent times. In particular these cases illustrate the advantages of the lower segment technique for Caesarean section and also the value of blood-transfusion and intravenous saline.

THE SEDIMENTATION TEST IN THE DIFFERENTIAL DIAGNOSIS OF ACUTE SALPINGO-ÖOPHORITIS, ACUTE APPENDICITIS AND EXTRA-UTERINE PREGNANCY.

Using 200 millimetres capillary tubes (Westergreen's method), the authors investigated the sedimentation rate in cases of acute salpingitis, acute appendicitis and extra-uterine pregnancy. The results are given in detail and reference is made to the literature. The normal rate of sedimentation is 6 to 8 millimetres after one hour and 12 to 15 millimetres after two hours.

In 45 cases of acute salpingo-oöphoritis the sedimentation rate was always increased, the average figures being 50.09 millimetres after one hour and 81.14 millimetres after two hours. A normal reading in this disease indicates that the infection is quiescent. The increase in sedimentation rate does not reach its maximum until 48 hours after the onset of symptoms, but even in that initial period it is considerable. It is a more reliable means of diagnosis than the white blood-cell count; only 60 per cent of these patients had leucocytosis. Neither the occurrence of leucocytosis nor pyrexia affects the sedimentation rate.

One hundred and forty-eight cases of acute appendicitis were studied. Even gangrenous appendicitis produced a less rapid sedimentation than did salpingitis. In practice catarrhal and purulent appendicitis are more likely to be confused with salpingitis than is gangrenous appendicitis. These forms of appendicitis show a much slower rate of sedimentation. In catarrhal appendicitis the figure was normal in 96.6 per cent, and in purulent appendicitis no pathological increase was noted in 85.7 per cent of cases. The authors conclude that if sedimentation is more than 20 millimetres in the first hour, the diagnosis of salpingitis rather than appendicitis should always be made. The failure of appendicitis to produce a large increase in the sedimentation rate is possibly due to the appearance of symptoms at a relatively early stage in the disease, or possibly due to a difference in anatomy and innervation.

Consideration of extra-uterine pregnancy is complicated by the fact that it frequently occurs in Fallopian tubes previously inflamed, or infection often supervenes. The sedimentation rate also depends on the condition of the pregnancy. If the pregnancy is uncomplicated the rate is slightly increased and corresponds exactly to the increase which occurs in normal pregnancy. In cases of tubal abortion and tubal haematocele, the average sedimentation rate was 18.8 millimetres after one hour and 41.6 millimetres after two hours. It is more rapid than in appendicitis but slower than in salpingitis. In distinguishing ectopic gestation from salpingitis, the sedimentation test should be used in conjunction with the Freidman test. When rupture of the tube occurs the sedimentation rate remains normal at first, but later becomes very rapid, approaching that associated with acute salpingitis. The sedimentation test is not of much clinical value in such cases and is not required.

The authors consider that estimation of the sedimentation rate, although a diagnostic procedure of secondary importance, is nevertheless valuable in distinguishing acute salpingitis from acute appendicitis, and extra-uterine pregnancy from acute salpingitis.

PUDENDAL ANAESTHESIA IN OBSTETRICS.

The technique of anaesthesia described is based on the method of Daels and Van Damme and was originally introduced for forceps deliveries in patients suffering from phthisis. Since the nerve supply to the levator ani muscle lies on its under surface, the local anaesthetic is injected superficially to this muscle.

With the patient in the lithotomy position, a 10-centimetre needle is introduced at a point midway between the anus and ischial tuberosity. It is pushed horizontally until the resistance of the levatores ani muscles is met. After injecting the anaesthetic solution, the needle is slightly withdrawn and then directed deeper and more posteriorly. The ischio-rectal fossa is infiltrated and will take as much as 100 to 150 cubic centimetres of tutocaine solution (2 in 1000). The perineum itself is next infiltrated and finally the labia majora. The needle may be directed by means of two fingers inserted into the vagina.

The levatores ani become paralysed within five minutes and the lower part of the vagina, the vulva, and the perineum become insensitive. The

anaesthesia is of value only for *low* forceps deliveries or for such operations as episiotomy.

Eighteen cases are described with 15 good or very good results.

One of the advantages of this method of anaesthesia is that the patient retains the use of the abdominal muscles and can assist in the delivery.

T. N. A. Jeffcoate.

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Comparative studies of ovarian function in guinea-pigs and cats. K. Tietze.
Toxaemic symptoms in pregnancy simulating tabes dorsalis. H. Offergeld.
Methods of testing oxytocic substances on the rabbit's vagina. H. Runge, W. Beck, and E. Hunt.
*Congenital skin defects. L. P. H. J. de Vink.
*Tubal pregnancy and the Aschheim-Zondek reaction. H. Klinkenberg.
*Development of the human vagina. Part V. Vagina infima septa. Robert Meyer.
The significance of the uterus and adrenals in luteinization. W. Wobker.
*Interstitial pregnancy. T. K. Andrianakos.
*Proliferative changes in the uterine mucosa after the intra-uterine application of oestrogenic substances. P. Grumbrecht and A. Loeser.
*The significance of the vegetative nervous system in the endocrine function of the anterior lobe of the pituitary. L. Herold and G. Effkemann.
Respiration and oxygen-combination curve of the blood during pregnancy. W. Borgard and G. Effkemann.
Estimations of follicular hormone in blood and urine during labour. G. Tsutulopulos.
*The latent period of commencing carcinoma of the cervix and the duration of the symptomless period. E. Scipiades, jun., and K. S. Stevenson.
The effect of protracted administration of follicular hormone on the female genital organs in rats. K. Biedermann.
Hormonal aetiology of hydrops foetus universalis. E. Tscherne.
*The effect of follicular hormone on the vaginal epithelium in children: dosage in gonorrhoeal vaginitis in children. K. Herrnberger.
*Hormonic conditions in chorion-epithelioma. W. Rust.
Circulatory function in pregnancy and the puerperium: a study of oxygen metabolism during rest and labour. G. Effkemann and W. Borgard.
Round-cell infiltration in the placenta and its appendages: with a note of its connexions with infectious diseases in the newborn. H. Kückens.
Significance and prevention of a goitre in the newborn. H. Guggisberg.

CONGENITAL SKIN DEFECTS.

De Vink describes symmetrical defects of the epidermis affecting the knees in a full-time uniovular twin born at term, the other twin being a papyraceous foetus. The comparative rarity of epidermal defects in the extremities and their not very infrequent familial occurrence are brought

out in a review of the literature; and the reasons are given against the theory of their causation by foeto-amniotic adhesions followed by amniotic bands. The hereditary causative factor is better established in veterinary pathology, and specially neatly in two extensive familial series in oxen, recorded in America and Holland respectively in which a common sire, imported from the one to the other country, could be traced. A recessive inherited factor is in all probability concerned, and the deformity occurs, in the expected proportions of the progeny, when a couple is mated of which both partners carry such a factor.

TUBAL PREGNANCY AND THE ASCHHEIM-ZONDEK REACTION.

For proof of normal intra-uterine pregnancy, hydatidiform mole and chorion-epithelioma, all the grades of positive response should be present in the test mice; but a Grade I positive result (the other grades being negative) is sufficient to justify operation, when not contra-indicated on clinical grounds, if there is clinical reason to suspect ectopic pregnancy. In 10 of 39 cases, confirmed at operation, of ectopic pregnancy the ovaries of the test animals gave a positive Grade I but negative Grade II and Grade III findings.

DEVELOPMENT OF THE HUMAN VAGINA.

Concluding in a comparatively brief communication, pages 306 to 338, his monumental account, Robert Meyer describes certain developmental peculiarities, not sufficiently marked to constitute deformities, but conceivable as the precursors of such. He includes a detailed macroscopical and microscopical account of four cases (in foetûs of 150 to 270 millimetres) of "vagina infima septa" and one in which the Wolffian ducts communicated asymmetrically with the dorsolateral sinus grooves. The probabilities of such peculiarities becoming normal before birth are weighed, the decisive factor being judged to be the ripening of the vaginal epithelium rather than the regression of the Wolffian epithelial zone: the septum is a remnant of the Müllerian eminence, a portion of the urorectal septum. The presence of the hymen in cases of double vaginal orifice shows the independence of its development from that of the vagina: it is a derivative of the sinus epithelium, and the space behind the hymen is the persisting portion of the dorsal chamber. Persistence of the vaginal septum is due, essentially, to a disproportion between mesenchymal and epithelial growth. The Wolffian duct plays as little part in the abnormal as in the ordinary development of the vagina.

INTERSTITIAL PREGNANCY.

In an historical introduction Andrianakos describes seven signs for the anatomical diagnosis of an interstitial site of pregnancy, five being suitable for diagnosis during operation. The decisive macroscopical and microscopical criteria in an examination, which alone are conclusive of the parts removed at operation, are specified. While radical measures are usually advisable, conical resection of the cornu uteri and extirpation of the Fallopian tube can be carried out in some cases, haemostasis then being favoured by ligation of the uterine artery towards its end (Cotte and Rouay). Two cases

are described in detail, one being complicated by a twisted ovarian cyst on the other side: in both the diagnosis was established only by examination of the specimen, a complicated myoma of the uterine cornu having been thought to be present.

PROLIFERATIVE CHANGES IN THE UTERINE MUCOSA AFTER THE INTRA-UTERINE APPLICATION OF OSTROGENIC SUBSTANCES.

Zondek reported that such application was without effect on the endometrium or myometrium: this was apparently due to inhibition of the local response by over-stretching. Grumbrecht and Loeser in experiments in guinea-pigs, rabbits and rats found that intra-uterine injections, if in small amounts, viz., 0.02 to 0.05 cubic centimetres, of oestrogenic substances had an effect equal to that of 10 to 12 times greater doses given parenterally. After local application of the watery hormone solutions hyperplasia of the myometrium and proliferation of the mucosa were perceptible after 24 hours and still well-marked after 16 days. Toleration was excellent. These experimental results were taken to justify similar therapeutic trials in women. Three patients were treated by the intra-uterine introduction, during the first half of the cycle, of cocoa-butter styles containing 500 international units of oestron. They suffered respectively from hypomenorrhoea, secondary amenorrhoea and oligomenorrhoea; and all had ovarian insufficiency and uterine hypoplasia in some degree. In the first the menses became increased in duration and flow, and an acne which had been present improved. In the second and third the subsequent menstrual history cannot yet be given, but curettings, before and after, showed the production of marked proliferative changes. In the third an increase in the size of the uterus was felt.

THE SIGNIFICANCE OF THE VEGETATIVE NERVOUS SYSTEM IN THE ENDOCRINE FUNCTION OF THE ANTERIOR LOBE OF THE PITUITARY.

The administration of follicular hormone to infantile rats, by an intermediate effect through the antuitary, leads indirectly to corpus luteum formation in the ovaries. Such formation is absent in animals in which the connexion of the pituitary and the central nervous system has been severed by cutting the pituitary stalk. The chain of events causing folliculin to lead to yellow body formation consists partly of endocrine, partly of nervous reactions. The pituitary-midbrain system is to be regarded as a shunting station in which nervous and hormonic stimuli are co-ordinated; and a greater degree of subordination of the latter to the former is postulated than has previously been imagined.

THE LATENT PERIOD OF COMMENCING CARCINOMA OF THE CERVIX AND THE DURATION OF THE SYMPTOMLESS PERIOD.

The earlier attempts, from 1907 onwards, histologically to diagnose cancerous cervical epithelium before it has become invasive are reviewed; and the changing opinions concerning the young carcinoma and precancerous lesion are traced. Schiller's description of the commencing carcinoma marks a radical and practically important revulsion from the therapeutically nihilistic definition of Virchow, which demanded demonstration of tissue-

invasion: there is an early carcinoma, not a precancerous condition, characterized by cellular atypia and polymorphism. It is unfortunate that certain American and other writers have not yet abandoned Virchow's postulates: dermatologists are familiar with histological pictures resembling those of Schiller, and they can be seen in experimental tar-painting and in chronic arsenical intoxication. The reason is chiefly that physicians only very rarely encounter the commencing carcinoma and pathologists meet it only as an accidental finding: its initial symptom-free course lasts for a very considerable period. The study of the commencing or young carcinoma is greatly helped by Schiller's iodine test and Hinselmann's colposcope.

Reckoning back from advanced cases of cancer of the cervix, Staehler has calculated that the average symptomless period is 2.7 months: this is confirmed by Goecke and by Liepelt. Staehler reckons that in one in eight patients the growth is already inoperable at the time of appearance of the first symptoms. The authors were moved to the present investigations by a case in which non-invasive surface carcinoma was found in material from an erosion: the biopsy taken from a glandular erosion, seven years previously happened to be available, and, on examination in serial sections, showed similar carcinomatous zones; two children had been born in the meantime.

Re-examining the pathological material of the Johns Hopkins Hospital from 1917 to 1937, Scipiades and Stevenson found 19 cases which in the light of present-day knowledge could be diagnosed as commencing carcinoma but had previously been otherwise labelled. These constitute 2.74 per cent of cervical cancer cases: the corresponding figures given by Schiller and by Pemberton and Smith are 2.96 and 2.39 per cent respectively (*Surgery, Gynecology and Obstetrics*, 1934, lix, 1). The 19 cases have been described elsewhere (*ibid*, lxvi, 5, 138). Only seven could be fully followed up clinically and pathologically. They showed a latent period free from symptoms, or extension of the early carcinoma, of at least six months and lasting in some instances six or eight years. From correlation of the authors' statistics with other relevant statistics an average of 3.9 years is established.

The present writers had five cases in which, 8 to 15 years after, retrospective examination had shown incipient carcinoma in biopsy or operative material, e.g. from trachellorrhaphy or curettings, no sign of carcinoma could be found. From their own material and that of others it appears that the very early neoplasms described were invariably cured by conservative measures, amputation of the cervix, or radium treatment, or both. In nearly three-quarters superficial excisions alone, done not for therapeutic but for diagnostic purposes, led to cure. The authors turn to a critical consideration of epithelial over-activity in the sense of Robert Meyer and others, and of the precancerous alterations of v. Franqué and Guggenheim. They never found that they subsequently became carcinomatous: they regard them as transitory conditions of varied aetiology. Allusion is made to occasional cases in which serial examinations of the portio have revealed invasive, more advanced carcinoma when biopsy preparations have shown only the commencing carcinoma. The procedure recommended after detection by biopsy of a commencing carcinoma is amputation of the cervix and its examination in serial sections, followed (1) if nothing further is shown, by conservative treatment or possibly radium as a precautionary

measure; (2) if invasive growth is found by Schauta's or Wertheim's hysterectomy. More frequent use of Schiller's lugol test in hospital and private practice is earnestly recommended.

EFFECT OF FOLLICULAR HORMONE ON THE VAGINAL EPITHELIUM IN CHILDREN: DOSAGE IN GONORRHOEAL VAGINITIS IN CHILDREN.

The effect on the epithelium of dosage with follicular hormone is inferred from microscopic examination of the vaginal secretion. The findings in normal conditions at various ages from birth to 17, and after exhibition of follicular hormone are fully illustrated. Dosage in the treatment of gonorrhoea in children has varied greatly. Herrnberger finds that one intramuscular injection of 10,000 international units of oestradiol benzoate within six days has changed the few-layered epithelium of the child to one having as many layers of cells as the adult epithelium: this condition can be maintained by further oral daily doses of 1,000 units of alcoholic solution. Optimal dosage, i.e., the least amount of hormone giving this result without undesirable side-effects, is 1,000 units of alcoholic solution daily by the mouth: full epithelial development is attained in 17 days. With such dosage there is no harmful effect on ovaries, hypophysis or other organs. The production of leucorrhoea and swelling of the labia are not regarded as important and speedily disappear after the cessation of the treatment.

HORMONIC CONDITIONS IN CHORION-EPITHELIOMA.

The not very infrequent finding of a negative Aschheim-Zondek test in chorion-epithelioma has been ascribed to fibrin encapsulation of the tumour or its separation from blood circulation by massive blood-clots. That this explanation is not always correct is shown by certain cases in the literature and by one here recounted, in which necrosis and haemorrhage were absent from the neighbourhood of the tumour, in spite of a negative biological reaction.

In this case the ovaries contained no lutein cysts: this has usually been the case when urinary hormone excretion is not increased. Rust's second case shows in contrast how important hormone estimations may be in the absence of clinical signs of chorion-epithelioma: three months after expulsion of a hydatidiform mole, the patient, although free from morbid symptoms, had bilateral ovarian luteal cysts which had increased in size. Radical operation was done and showed the uterine wall to be infiltrated in places by neoplastic masses, although the chief tumour was to a large extent surrounded by necroses and fibrin.

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The technique of sterilization in the female with a recommendation of the inguinal route. H. Martius.
*A case of uterine torsion. G. Hagblom.
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The findings of systematic colposcopy in the Zurich Gynaecological Clinic. H. Wespi.
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Resection of the uterus *per vaginam*. E. Preissecker.

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The treatment of climacteric symptoms with α-phenyl-β-isopropyl amino-hydrophosphate. G. Bakacs.

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The question of injury to the ova from weak radiation of the ovary. H. v. Wattenwyl.

Pregnancy and progressive muscular dystrophy. K. Ulrich.
Sugar icing carcinoma of the corpus uteri with tubal metastasis. Ziya Üstün.
*Partial vesicular mole with living foetus. Kalman Thaisz.

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Remarks on the work of Dietel on the treatment of asphyxia neonatorum with inflation. F. Engelmann.
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Specific treatment of gonorrhoea in the female. B. Gyulay and I. Györffy.

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Routine examination for cancer in healthy women and its value. F. v. Mikulicz-Radecki.
Careful examination in obstetrics and gynaecology from the point of view of malignant disease. F. Lönne.
Rare causes of haemorrhage during delivery. H. Kastendieck.
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Stalked transplantation of the endometrium into the cervix in supravaginal amputation of the uterus. M. Matyas.

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Gynaecological obstetric questions in world medicine. A. Mayer.
Intra-uterine death, habitual abortion, sperm findings, and the use of marriage certificates. G. K. F. Schultze.
*The differential diagnosis of rupture of the membranes. A. Richard.
*The question of the formation of an artificial vagina. L. Kraul.
Pregnancy and irregular heart-beat with recovery. I. v. Zarday.
Atmokausis. K. Nordmeyer.

A Case of Uterine Torsion.

Hagblom describes the history of a case of a large multilocular ovarian cyst which caused acute torsion of the uterus. The patient was aged 59 years and unmarried. For about one year she suffered from unusual weariness and a sense of abdominal distension, and for four months after a blow on the chest she had noticed that there was a rapid increase in size of the abdomen and an onset of a moderate degree of pain. She was admitted to hospital at Allmänna Barnbördshuset in Stockholm with severe abdominal pain after having lifted some heavy furniture and knocked her abdomen against the corner of a table.

At the operation the abdomen contained cloudy blood-stained fluid and a multilocular left ovarian cyst whose stalk was arising in the right side of the abdomen with the round ligament lying behind and the ovarian ligament. On further investigation it was found that the uterus had twisted in a counter clock-wise direction through 180 degrees, the twist extending

in a long spiral involving the whole cervix and the lower half of the corpus uteri. There was no sharp constriction of the uterus, although part of the tumour had become necrotic. After removal of the cyst the uterus was untwisted and left in position.

The patient's convalescence after operation was satisfactory except for thrombophlebitis of the left ankle.

About 200 cases of torsion of the uterus have been recorded in the literature. In many of these there was an accompanying pregnancy, and in most cases a uterine or ovarian tumour was present. When the tumour was pedunculated the pedicle was also twisted.

The onset of symptoms of torsion of the uterus in some cases was extremely acute and in others chronic and mild. The diagnosis was in most cases incorrect, the symptoms being ascribed to extra-uterine pregnancy, acute appendicitis and peritonitis or simple torsion of an ovarian pedicle. The correct diagnosis was made only at the time of operation.

CONTINUATION OF A PREGNANCY AFTER PERFORATION OF THE GRAVID UTERUS WITH OVUM FORCEPS.

Eichfusz reports the case of a primipara, aged 22, who was brought to hospital by her doctor after he had attempted to evacuate the uterus with ovum forceps through a cervix dilated to No. 14 Hegar. He stated that he had perforated the uterus and had drawn down the omentum into the vagina.

In her history it appeared that one year before a pregnancy had been terminated and that on this occasion she had missed one menstrual period.

On admission a piece of omentum could be seen emerging from the external os, and this was fixed in position with a pair of Kocher's forceps to prevent its slipping back. There was no bleeding. The abdomen was opened and a small amount of fresh blood was found in the peritoneal cavity. The uterus was enlarged and soft. Behind the right cornu there was a hole measuring 1.5 centimetres through which the omentum was pulled. The omentum was divided outside the perforation and the distal portion extracted through the vagina, the perforation was closed in two layers, and finally strengthened by fixing the round ligament over it. There was a fresh corpus luteum in the left ovary. There were also two tears in the serous coat of the sigmoid flexure where it had been crushed by the forceps; these were repaired. Following the extraction of the omentum from the uterine cavity through the cervix there was such free bleeding that the cavity was packed with iodoform gauze, and this was left in position for two days. After its removal there was no further bleeding; the pregnancy continued for nearly seven months after the operation when she had a smart uterine haemorrhage and some labour pains which ceased under sedative treatment. Nearly four weeks later a more severe loss occurred and Caesarean section was carried out for a central placenta praevia. The mother and child were discharged well.

MENSTRUATION INDUCED BY THE ORAL ADMINISTRATION OF HORMONES.

Clauberg and Ustun carried out some clinical investigations with progynon C and proluton C.

With progynon C given by mouth they obtained the following results: (1) Uterine growth. (2) Proliferative phase hypertrophy of the uterine mucosa. (3) Uterine bleeding. (4) Signs of tubal growth.

With proluton C they obtained the following: (1) A recession of the secretory changes produced by progynon C. (2) True menstruation. (3) An alteration of pathological glandular cystic hyperplasia to a secretory phase with decidual reaction.

To obtain the same results as produced by progynon B oleosum progynon C must be given in doses twice or thrice as large. Proluton C by mouth must be given in doses six times as great as ordinary proluton given intramuscularly.

THE DEVELOPMENT AND PATHOLOGY OF CONGENITAL VAGINAL ATRESIA OF THE VAGINA.

Meyer of Berlin describes a specimen obtained after operation from Feldmann of Küstrin after operation upon a young girl of 15 years. The patient had a double vagina and uterus; on one side the vagina was closed at the lower end. The specimen was divided in two at the operation. The first consisted of the right uterine horn with a dilated patent ampulla from the opening of which blood, which had caused some adhesions of its wall, had escaped. The lower pole of this specimen which had been separated from the second half of the specimen was not covered by epithelium. The whole upper half of the specimen consisted, therefore, of the Fallopian tube and the upper uterine segment.

The lower half of the specimen, which consisted of a blood sac, was enclosed by walls formed by the vagina and cervical canal. The cervical canal had opened out so as to convert the blood cyst into a haematocolpos in the lower part and a haematocollum in its upper portion.

Histological examination of the walls of the entire specimen confirmed the supposition that the cervical wall had not been taken up to form part of the wall of the cyst.

The left uterine half and patent vagina were left in position, and, during the period of convalescence from the operation, further investigations were made. It was then found that the right kidney and right ureter were absent and that the left ureter was abnormally large. The left ureter was forked at its upper end and each division opened into a separate renal pelvis.

PARTIAL VESICULAR MOLE WITH LIVING FOETUS.

Thaisz describes the case of a primiparous patient who was delivered three weeks prematurely after early rupture of the membranes. The foetus, which was obviously premature, was born alive and survived. The placenta and membranes were expelled spontaneously five minutes after the birth of the foetus. As there was a somewhat free loss and the membranes were ragged an intra-uterine exploration was made; an old organized blood-clot of the size of a goose's egg was removed. The left arm of the foetus was 2 centimetres shorter than the right, and the second, third and fourth fingers of the left hand were webbed.

The placenta was found to be divided into two unequal divisions. The larger division was covered with amnion and its vessels ran into the cord

which was attached to its outer free margin. The smaller division had no defined vascular system and its relation to the amnion could not be defined because of the ragged state of this membrane. This smaller part was the seat of vesicular degeneration, the vesicles varying in size from that of a pea to that of a cherry. There was a very definite line of demarcation between the healthy placenta and the degenerated chorion.

The patient gave a history of irregular bleeding between the second month and the end of the fifth month after which time there was no recurrence.

Histological examination showed that normal chorionic tissue lay close beside vesicular degenerated chorion at the line of junction of the two portions of placenta. The condition appeared definitely to be one of degeneration of part of a single placenta and not a degeneration of one of two twin placentae. Good macroscopic and microscopic photographs are given to illustrate the text.

THE DIFFERENTIAL DIAGNOSIS OF RUPTURE OF THE MEMBRANES.

Richard Düsseldorf refers to the practical difficulty in deciding whether dampness of the vulva in late pregnancy is due to vesical incontinence or escape of liquor amnii. He considers it too risky to inject a dye into the amniotic sac to see whether it will be passed but prefers to stain the urine instead. For this purpose he uses a 0.4 in 1,000 solution of indigocarmine and injects 10 cubic centimetres intramuscularly. After the injection the patient is supplied with a clean white vulval pad and is told to take up a position in which the escape of fluid is most free. The pad is then inspected at frequent intervals.

If the pad is wet but not stained then the escaping fluid can be assumed to be liquor amnii. If the pad is wet and stained there is still the possibility that both liquor amnii and urine are present. In this case another dry pad should be deliberately moistened with the patient's urine and the depth of staining compared. If the fluid is entirely urine then the depth of staining will be the same on both pads.

THE QUESTION OF THE FORMATION OF AN ARTIFICIAL VAGINA.

Kraul refers to the suggestion made by Caffier in *Zentralblatt für Gynäkologie*, 1938, No. 22, that the epithelium from the Thiersch flaps in the Kirschner-Wagner operation and the foetal membrane in the Brindeau operation disappear and that in either case epithelialization results from an inward spread of the epithelium from the vestibule. In support of this suggestion he records a case which he examined under a short anaesthesia and found an entire absence of vagina, uterus, and adnexa in a girl of 19 years. At this examination he excised the imperforate hymen and split the tissues above it up to the peritoneum of the pouch of Douglas. The space so formed was packed with gauze which was left in position for four days. After removal of the gauze the cavity was irrigated daily with permanganate solution and on three occasions during the subsequent three weeks it was digitally stretched without an anaesthetic. Four weeks after its formation a canal of 7 centimetres length entirely lined with healthy epithelium, had formed. Four and a half months later there was a canal 6 centimetres in length which easily admitted one finger.

The writer, in view of this case, considers that the vestibular epithelium is capable of growing inwards to line an artificially made cavity without the intervention of any extraneous grafting.

R. H. B. Adamson.

Monatsschrift für Krebsbekampfung.

Vol. vi, Heft 10, October 1938.

Cancer deaths and cancer statistics. M. Meyer.
*Results of treatment of cancer of the body of the uterus. W. Bauer.

RESULTS OF TREATMENT OF CANCER OF THE BODY OF THE UTERUS.

Bauer records 77 cases seen at Düsseldorf from 1928 to 1937: 37 cases were treated by irradiation, 36 by abdominal radical operation, and 4 by vaginal total extirpation. The nulliparae numbered 36. The percentage of operable cases was 52—a low figure for patients in an urban area, but one dependent on the strict discrimination exercised in choosing patients for operation. The primary operative mortality was nil. An analysis of the 30 cases in which a 5 years' retrospective survey was possible showed 13 cures among 15 radical abdominal operations, 1 in 2 radical vaginal operations, and 5 among 13 irradiated cases. The total of 5-year cures was 63.3 per cent. The general view is held that while good final results may be achieved by irradiation, operative treatment with careful selection of cases is, on the whole, better.

W. E. Crowther.

Acta Obstetricia e Gynecologica Scandinavica.

Vol. xviii, Fasc 3.

The treatment of abortion. F. Holtz.
Development of the Blyclinic of Maternity in Gothembourg; its routine work and an attempt to assess the results obtained. E. Jerlov.
*Diagnostic radiography of placenta praevia. E. Petersen.
Experiences of a method of lessening the pains of labour with nitrous oxide. S. Karlson.
A case of diabetes insipidus traumaticus and pregnancy. E. Brattström.
A case of primary sarcoma of the Fallopian tube. B. Jörgensen.
*Insertio furcata funiculi umbilicalis. O. Herberz.
Mediastinal subcutaneous emphysema during delivery. K. Östling.

DIAGNOSTIC RADIOGRAPHY OF PLACENTA PRAEVIA.

Petersen describes his experience with the radiological examination of patients suspected of having a placenta praevia in Sonderborg. He has used the procedure, recommended by Ude and Urner, of cystography after the injection of 40 cubic centimetres of a 12.5 per cent solution of sodium iodide. He has found that there is a space between the shadow of the bladder and

that of the foetal head in cases of placenta praevia. Such a space is not found when the head is not supported by the placenta.

INSERTIO FURCATA FUNICULI UMBILICALIS.

Herberz refers to 6 cases of this condition, which he has observed in 2 years, out of a total of 6,000 deliveries. Two of his patients died during labour, 1 foetus was born partially asphyxiated; the rest suffered no harm. The writer thinks that this variation from the normal in the insertion of the umbilical cord may be more common than is generally thought, and he thinks it should be carefully looked for in cases of intra-uterine asphyxia.

R. H. B. Adamson.

REPORTS OF SOCIETIES

ROYAL SOCIETY OF MEDICINE

Section of Obstetrics and Gynaecology

A meeting of the Section was held on Friday, October 21st, 1938. The President, Mr. Aleck Bourne, was in the chair.

Dr. Howard C. Moloy of New York read a paper entitled:

The Influence of Pelvic Architecture on the Mechanism of Labour.

He stated that six years ago Caldwell started the study of pelvic size and shape with particular reference to the effect of the shape of the pelvis on the course of labour. He and Moloy were soon convinced that further study was necessary on account of the unsatisfactory classification existing. Anthropological study and careful X-ray photography and the use of the precision stereoscope gave them new views on the pelvis.

They now described four main types:

(1) The anthropoid, or ape-like, pelvis, with a long antero-posterior diameter.

(2) The gynaecoid or round pelvis.

(3) The platypelloid or flattened pelvis.

(4) The android or wedge-shaped pelvis with its widest transverse diameter very near the back.

All variations between these types may be found.

The history of the previous work on the subject was reviewed, and it was shown that much of the work had been done before but the results were never correlated.

The shape of the cavity of the uterus may also vary. This is most easily seen in variations in the sub-pubic angle and the width of the sacrosciatic notch, and the result may be a pelvis roomy either in front or behind.

These various types of pelvis affect the obstetric position in which the head settles in the pelvis, and figures were given of the frequency in a series of cases. The shape of the pelvic cavity also affects the mechanism of labour, and experience had shown that the android type of pelvis was the least favourable. It was shown that an exact knowledge of the type of pelvis and the course of labour to be expected might often be of great assistance in determining the correct method of treatment. The value of Barton's forceps in certain cases of transverse arrest was illustrated.

Professor F. J. Browne, Professor Munro Kerr, Professor Maxwell, Dr. Nicholson, Professor Chassar Moir, Professor Young, Miss Kenney and the President, Mr. Aleck Bourne, took part in the discussion.

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